Record of Decision
for Lead-Contaminated Soil,
Operable Units 00 through 3
at the
Eureka Mills NPL Site
Eureka, Utah

September 2002

U.S. EPA Region VIII

Utah Department of
Environmental Quality

DECLARATION OF THE ROD

Site Name and Location

Eureka Mills NPL Site
Residential and Adjacent Mining Areas Operable Units 00 through 3
Eureka, Utah 84628

CERCLIS EPA Identification Number: UT0002240158

Statement of Basis and Purpose

This Decision Document presents the selected remedial actions for the Residential and Adjacent Mining Areas, Operable Units (OUs) 00 through 3, for the Eureka Mills NPL Site (Site). The Site includes the residential and commercial portions (OU 00) of the City of Eureka Utah; as well as mining areas located to the east of Eureka (OU 1); west of Eureka (OU 2); and central Eureka (OU3).

This Record of Decision (ROD) has been developed in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, 42 USC §9601 *et seq.*, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300. This decision is based on the Administrative Record for the Site.

The remedy for lead contaminated soils in the residential and mine waste areas was selected by the U.S. Environmental Protection Agency (EPA). The Utah Department of Environmental Quality (UDEQ) concurs with the Selected Remedy.

Assessment of Site

The Site includes the residential and commercial portions of the City of Eureka, adjacent mining areas, and non-residential areas.

The remedial action selected in this ROD is necessary to protect the public health and welfare from actual releases of hazardous substances into the environment. Such a release presents an imminent and substantial endangerment to public health, welfare or the environment.

Description of Selected Remedy

The Selected Remedy for the residential and mine waste areas address lead-contaminated soil at the Site. The cleanup strategies will address the soil principal threats through source removal, source control, and on-site landfill disposal.

The major components of the selected remedy for **residential properties** include:

- Cleanup of lead contaminated soils in yards;
- Disposal of contaminated soils in a repository;
- Public health actions until the remedial action is completed;
- Institutional controls to ensure the long-term protectiveness of the remedy.

The major components of the selected remedy for **mine waste areas** include:

- Regrade all mine waste piles and cover with either a rock or vegetative cover to prevent dust blowing or surface water runoff;
- Addressing non-residential areas primarily in the south-east quadrant of the Site as further discussed in the ROD;
- Implement institutional controls at all mine waste areas and non-residential areas.

Statutory Determinations

The Selected Remedy for OUs 00-3 is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate for the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the extent practicable.

A statutory review will be conducted within five years after initiation of the remedial actions (and at 5-year intervals thereafter) to ensure that the remedies continue to provide adequate protection of human health and the environment, because some contamination (i.e., hazardous substances) will remain on site.

ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record for this Site.

- Contaminant of potential of concern (COPCs) and their respective concentrations *(Section 5.3.1 and 5.4);*
- Baseline risk represented by the COPCs *(Sections 5.4.1 and 5.4.2);*
- Cleanup levels established for COPCs and the basis for these levels (*Section 5.5*). Remedial action objectives for these remedial actions (*Section 6.2) ;*
- How source materials constituting principal threats are addressed *(Section 9.0)*;
- Current and reasonably anticipated future land assumptions used in the baseline risk assessment *(Section 5.4)*;
- Potential land uses that will be available at the site as a result of the selected actions *(Section 5.4);*
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs; discount rate; and the number of years over which the cost estimates are projected *(Sections 8.1.7 and 8.2.7);*
- Key factors that led to selecting the remedial actions *(Sections 5.0 and 6.0);*
- Description and rationale for Selected Remedy (*Section 10.0*).

Authorizing Signature(s)

This Record of Decision documents the Selected Remedial Action to reduce the exposure of local residents, in particular, children under the age of seven years, to lead in the environment at the Site.

The following authorized official at EPA Region VIII approves the Selected Remedy as described in this ROD.

Max H. Dodson
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation
U.S. Environmental Protection Agency, Region VIII

9/30/02
Date

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LIST OF ACRONYMS

µg/dL	micrograms per deciliter
ARAR	applicable or relevant and appropriate requirement
BHHRA	baseline human health risk assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPCs	contaminants of potential concern
CSM	conceptual site model
CTE	central tendency exposure
CUPHD	Central Utah Public Health Department
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
FS	feasibility study
GSD	geometric standard deviation
HEPA	high-efficiency particulate air
HQ	hazard quotient
HRS	hazard ranking system
ICP	inductively coupled plasma - atomic emission spectroscopy
IEUBK	Integrated Exposure, Uptake and Biokinetic Model
ISE	integrated stochastic exposure
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	operation and maintenance
OUs	operable units
Pb	lead
ppm	parts per million
PRG	preliminary remediation goal
PRP	potentially responsible party
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
ROD	record of decision
RPA	removal preliminary assessment
SARA	Superfund Amendments and Reauthorization Act of 1986
SF	slope factor
SI	site investigation
UAC	Utah Administrative Code
UCA	Utah Code Annotated
UDEQ	Utah Department of Environmental Quality
UDOH	Utah Department of Health
XRF	x-ray fluorescence

THE DECISION SUMMARY

This Decision Summary provides a description of the site-specific factors and analyses that led to selection of the final remedy for residential and mine waste areas of the Site. It includes information about the Site background, the nature and extent of contamination, the assessment of human health risks, and the identification and evaluation of remedial alternatives.

The Decision Summary also describes the involvement of the public throughout the process, along with the environmental programs and regulations that may relate to or affect the remedial alternatives. The Decision Summary concludes with a description of the Selected Remedy in the ROD, and a discussion of how the Selected Remedy meet the requirements of CERCLA.

Documents supporting this Decision Summary are included in the Administrative Record for the Site. Key documents include the Final Remedial Investigation Report, the Final Feasibility Study, the Baseline Human Health Risk Assessment and the Proposed Plan for the Site.

1.0 SITE NAME, LOCATION, DESCRIPTION AND HISTORY

1.1 Site Name, Location, and Description

The Site is located in the East Tintic Mountains of extreme northeastern Juab County, Utah. The common geographic coordinates are latitude 39°57'00"and longitude 112°07'27" As illustrated in Figure 1-1, the Site includes the residential and commercial portions of the City of Eureka and the following associated mining areas: Godiva Shaft, Godiva Tunnel, May Day Shaft, Chief Mine No. 1, Chief Mine No. 2, Chief No. 1 Mill Tailings and Chief Mill No. 1, Chief Mill Site No. 1, Eagle and Bluebell Mines, Gemini Mine, Bullion Beck Mine, Bullion Beck Mill, and the Eureka Hill Mine as well as non-residential areas designated as DM-6, DM-10, DM-22, and DM-25. Eureka is approximately 80 miles southwest of Salt Lake City and 40 miles southwest of Provo. There are fewer than 800 residents in Eureka. Data from the 2000 census indicates that approximately 300 children live in Eureka.

EPA is the lead agency for CERCLA actions involving the Site . The Utah Department of Environmental Quality (UDEQ) is the state support agency. The remedial actions described in this ROD will be conducted by EPA utilizing the Superfund trust fund. The State of Utah will provide support concerning state cleanup requirements.

1.2 Site History and Enforcement Activities

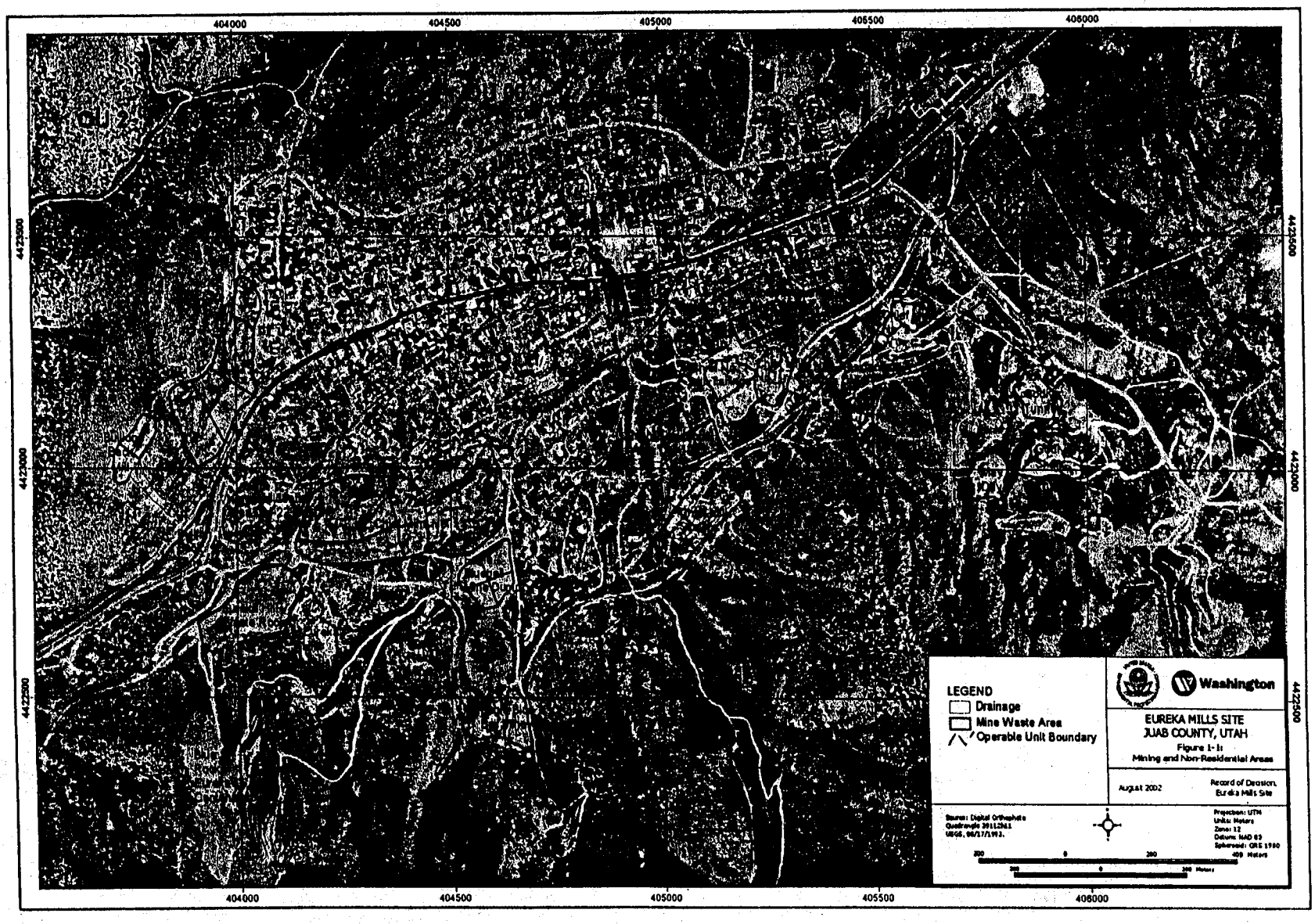
Eureka was founded in 1870 upon the discovery of a high-grade mineralized outcrop containing silver and lead, as well as smaller amounts of other minerals including gold, copper, and arsenic. Active mining continued until the silver bust in the late 1800s and early 1900s. Mining continued in the area until 1965, when activities began to significantly decline.

Several large waste rock piles and associated waste material resulting from mining operations are located primarily on the south side of the valley and at the western edge of town, near the town's residences and businesses. Mine waste had been distributed around Eureka due to activities associated with mining, such as transport along rail lines and milling operations. Some of the waste pile material has been used for urban construction in Eureka, which has resulted in the distribution of mine wastes to areas within the city. Wind and water erosion have also contributed to the extent of contamination at the Site.

Environmental sampling conducted at the Site showed the presence of high levels of lead and arsenic. Sampling programs performed in the latter half of 2000 confirmed that metals are present in the mine waste piles, in residential and non-residential soils, and within the interiors of some residences and commercial properties. Sampling also showed that the lead and arsenic are co-located. Lead is the primary contaminant of concern for soils; however, other metals, including arsenic, are also present. Dust samples collected from building interiors demonstrated that both lead and arsenic are present in some homes.

In 2000 and 2001, the Utah Department of Health (UDOH) and the Central Utah Public Health Department (CUPHD) performed blood lead testing and conducted surveys on children who live in Eureka. Based on the blood lead data, EPA began an Emergency Removal Action in July 2001 to clean up residential yards with soil lead levels exceeding 3,000 ppm. The yards of residences where children live who have elevated blood lead levels were also targeted for clean up. In 2001, EPA cleaned up 44 properties and has cleaned up 28 additional properties during 2002 as part of its Emergency Removal Action. On June 14, 2001, EPA proposed the Site for inclusion on the Superfund National Priorities List (NPL), which allowed Eureka to receive federal funding for the cleanup. On September 5, 2002, the Site was finalized on the NPL.

As part of its enforcement activities, EPA began a potentially responsible party (PRP) search in 2000. EPA has identified several PRPs, including mining and railroad companies which currently own or previously owned property and/or conducted mining activities at the Site. EPA has informed six parties of their potential site-related liabilities under the Superfund law. EPA will be working with the U.S. Department of Justice to negotiate legal settlements with these PRPs to perform or finance the cleanup of the Site (in whole or in part). In addition, EPA has completed legal agreements with a number of PRPs to secure EPA access to private property for investigative, sampling, and cleanup purposes.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LEGEND
Drainage
Mine Waste Area
Operable Unit Boundary
Washington
EUREKA MILLS SITE
JUAB COUNTY, UTAH
Figure 1-1:
Mining and Non-Residential Areas
August 2002
Record of Decision,
Eureka Mills Site

2.0 COMMUNITY RELATIONS

During the drafting of the RI & FS reports, EPA worked with a Technical Work Group in Eureka to obtain early input from residents, local government officials and representatives of several PRPs on the alternatives that were being evaluated. In the spring of 2002, preliminary drafts of these documents were provided to the Technical Work Group for their review prior to meetings to discuss the merits and concerns of EPA's work.

EPA has issued numerous Fact Sheets on this Site to inform the public about the Superfund Process and EPA activities at the site. A community involvement plan was prepared in October 2001.

A public comment period for the Proposed Plan was held from July 23, 2002 until August 21, 2002. The notice of availability of the Proposed Plan and the opportunity to comment was published in the Provo Daily Herald and the Eureka Reporter on July 19, 2002. The Proposed Plan was mailed to approximately 450 Eureka residents. A public meeting was held on July 31, 2002 to present the Proposed Plan to the public. At this meeting, representatives from EPA and UDEQ answered questions about the Site and the Proposed Plan. EPA also took public comment at this meeting. EPA's response to the comments received during the public comment period is included in the Responsiveness Summary, which is part of this ROD.

The Proposed Plan, Remedial Investigation Report (RI), Feasibility Study Report (FS), Human Health Baseline Risk Assessment, as well as other technical and site-related documents were made available to the public in July, 2002. They can be found in the Administrative Record file, which is located at the EPA Superfund Records Center, 999 18th Street (3rd Floor, South Tower), Denver, CO; the UDEQ Division of Environmental Response and Remediation,168 North 1950 West, Salt Lake City, UT; and at Eureka City Hall,15 No. Church Street, Eureka, UT.

3.0 SCOPE AND ROLE OF RESPONSE ACTION

This section describes the scope of the selected response actions for OUs 00-3. Past response activities are also summarized.

3.1 Designation of Operable Units

The Site includes the Residential and Adjacent Mining Areas, (OUs) 00 through 3, located within and in the vicinity of the City of Eureka, Utah. Each OU is described below.

- OU 00: Site wide, including the residential and commercial portions of Eureka.
- OU 1: Mining areas located to the east of Eureka, including Godiva Shaft, Godiva Tunnel, and May Day Shaft.
- OU 2: Mining areas located to the west of Eureka, including Gemini, Bullion Beck Mine and Bullion Beck Mill.
- OU 3: Central Eureka, including Chief Consolidated Mining Company properties and non-residential areas sites.

This ROD addresses the Selected Remedial Actions to be implemented by EPA to reduce local residents' exposure to lead from soil and lead dust in the environment as part of OUs 00 through 3. Subsequent to the completion of the RI and the BHHRA, EPA changed the designation of operable units for the Site. Operable Unit 00 Site Wide will now include the residential and commercial portions of Eureka that were formerly OU 01; OU 01 includes the areas that were formerly in OU 02; OU 02 includes the areas that were formerly in OU 03 and OU 03 includes the areas that were formerly in OU 04. The FS report reflects this change in OU designations.

A fourth Operable Unit (OU 4) (which used to be OU 05) consists of all groundwater, surface water, and ecological areas associated with the Site , and is being investigated and reported separately from this ROD.

3.2 Past Response Action

A Site Inspection (SI) was conducted in July 2000 to collect and assess data from seven mine waste areas to determine if further action was required. Based upon a review of the SI sampling results, EPA determined that an expanded sampling program was necessary and subsequently conducted a Removal Preliminary Assessment (RPA). The RPA was performed between August and November of 2000 as two phases: the Eureka Mills Site (UOS, 2001a) and the Eureka Mills Outside (UOS, 2001b). The "Eureka Mills Site" sampling was conducted in the residential and commercial areas of Eureka; the "Eureka Mills Outside" phase encompassed mine waste areas. EPA used the data generated by the RPA for the baseline risk assessment and to support the Hazard Ranking System (HRS) scoring package, as well as to determine if response actions were required. A third sampling

event, the interim sampling, took place between July and mid-December 2001 (UOS, 2001c). This sampling event included additional sampling at 36 residential properties and new access sampling at 23 residential properties.

In 2000 and 2001, UDOH and CUPHD performed blood lead testing and conducted surveys on children who live in Eureka. Based on the blood lead data, EPA began an Emergency Removal Action in July 2001 to clean up residential yards with soil lead levels exceeding 3,000 ppm; the yards of residences where children live who have elevated blood lead levels were also targeted for clean up. In 2001, EPA cleaned up 44 properties and cleaned up 28 additional properties during 2002 as part of its Emergency Removal Action.

4.0 SUMMARY OF SITE CHARACTERISTICS

This section summarizes regional characteristics and site conditions, including climate, geology and hydrology, as well as sampling results for the Site.

The East Tintic Mountains are approximately 10 miles wide, bounded to the west by Tintic Valley and to the east by Goshen Valley. These valleys lie at elevations of 5,600 feet and 4,500 feet, respectively. Such large intermontane valleys are typical of great basin valleys being filled with gently sloping alluvial deposits derived from the mountains surrounding them (USGS, 1975).

Eureka is situated in a southwest trending valley on the west side of the East Tintic Mountains and drops in elevation from 6,500 feet to 6,300 feet above mean sea level. Packard Peak is located approximately two miles to the north-northwest, and Eureka Peak is located approximately one mile to the southeast.

Eureka is northeast of the head of a drainage basin for Eureka Creek. The drainage, Eureka Gulch, extends through town adjacent to U.S. Highway 6. The southwest and downslope portions of Eureka Gulch becomes narrower with steeper slopes on both sides (USGS, 1975).

Areas of potential flooding in Eureka include areas adjacent to Eureka Creek at the base of Eureka Gulch. Eureka Creek is ephemeral, flowing only during heavy runoff from rainfall or snow melt.

4.1 Climate

The mountains that flank the Eureka valley greatly affect local climatic conditions. The climate in the site vicinity is temperate and semiarid, typified by warm summers and cold winters. Average monthly temperatures vary from a high of approximately 85.9 °F in July to a low of about 16.6 °F in January. During the summer months, the average diurnal temperature variation is 31.2 °F; during the winter months, it is 20.3 °F (WRCC, 2001a).

The annual average total precipitation is approximately 17 inches. Annual average total snowfall is 120.3 inches, and annual average snow depth is 2 inches (WRCC, 2001a). According to the Western Regional Climate Center (WRCC), the prevailing wind direction in Provo, Utah from the southeast with a secondary direction from the northwest. Provo is located approximately 40 miles northeast of Eureka. WRCC reports there is no wind data for Eureka or the surrounding area (WRCC, 2001b).

4.2 Soils

In the City of Eureka, two types of soils predominate. Deer Creek loam is present throughout most of the town on the north side of Main Street, which bisects the town. This soil is very deep and well drained and is found on alluvial fans. This soil consists of cobbly loam to about 7 inches in depth, cobbly clay to about 35 inches in depth, and cobbly clay loam to about 60 inches or more in depth.

Lizzant loam predominates in town on the south side of Main Street and extends into a small area adjacent to Main Street on the north side. This soil also predominates in locations adjacent to the Site's source areas (mine waste dumps and tailings piles) to the south and west sides of town. Lizzant loam is very deep and well drained and is found on mountainsides, hillsides, and alluvial fans. This soil consists of very cobbly loam at the surface and very strongly calcareous, very cobbly loam at about 9 inches in depth (USSCS, 1984).

4.3 Geology

The East Tintic Mountains are a composite fault-block range comprising moderately folded and faulted Paleozoic sedimentary rock that is partly overlain by Tertiary volcanic deposits. The sedimentary rocks range in age from late Precambrian to late Mississippian and are more than 9,000 feet thick. From oldest to youngest, the sedimentary rocks include 2,800 feet (average) of Tintic Quartzite and more than 7,000 feet of Lower Cambrian through Upper Mississippian age limestone (Morris, H.T and T.S. Lovering, 1979).

The primary volcanic rock in the East Tintic District is Packard Rhyolite. It extends north and east from Eureka and ranges in thickness from a few feet to more than 3,300 feet thick. Eureka Gulch and the central part of the East Tintic Mountains contain both sedimentary and volcanic rocks that are cut by stocks, plugs, dikes, and sills of intrusive rock. In addition, numerous dikes of intrusive breccia characterized by abrasion-rounded pebbles of quartzite are also found cutting the host rocks. The most significant metalliferous mineralization occurs in and around these intrusive rocks and breccia (Morris and Lovering, 1979).

Metalliferous mineralization in the East Tintic Mountains are classified as replacement deposits, replacement veins, and fissure veins. Replacement deposits are the largest deposits in the Tintic Mining District and occur predominantly in dolomite or limestone. Ore grade replacement deposits most frequently contain lead, silver and zinc mineralization and can range in size from 1 ton to 20 million tons of ore grade material. Approximately 90% of the District's ore production came from replacement deposits (Morris and Lovering, 1979).

Replacement veins occur chiefly as tabular deposits along contacts with the Silver City stock. They almost completely replace breccia in the faults with ore grade mineralization producing ore shoots that may expand on crossing fractures and bedding planes. Replacement veins contained substantially less ore tonnage than replacement deposits and account for only 5% of the District's production (Lovering, 1949; Morris and. Lovering, 1979).

Fissure veins occur in a myriad of short faults that cut through essentially all of the host rock types. The ore shoots formed are commonly less than 3 feet thick and no more than 600 to 1,000 feet in breadth and length. Fissure veins contained substantially less ore tonnage than replacement veins; however, they were more abundant, thereby accounting for the other 5% of the District's production (Lovering, 1949).

The primary ores of the Tintic Mining District contain galena, sphalerite, cerussite, acanthite, argentite, tetrahedrite, tennantite, enargite-famatinite, proustite, hessite, calaverite, native gold,

native silver, and a wide variety of relatively uncommon copper-, lead-, silver-, and bismuth- bearing sulfosalt minerals. Deep oxidation of these ores has further produced a great variety of sulfates, carbonates, silicates, arsenates, antimonates, and manganates (Morris, 1989).

4.4 Hydrogeology

As described in Section 4.3, Eureka is founded on two types of rocks. Basement sedimentary rocks of quartzite and limestone were folded, faulted, and eroded. These were then covered with Packard Rhyolite lava to a great extent and then once again subjected to prolonged weathering. These sedimentary and igneous rock types differ radically in their relations to groundwater.

Areas underlain by the sedimentary rocks are practically barren of springs and wells and the rocks themselves are barren of water to great depths. Water can apparently descend to great depths in the limestone and quartzite fractures.

In contrast, numerous springs and wells are found in areas where the igneous rock constitutes the surface formation. Unfractured, this rock acts as an aquaclude for water percolating down through the eroded upper portion of the strata. Rain percolates into the weathered contact material until it is prevented from going deeper by the underlying unweathered rock. This meteoric water then accumulates or seeps along the surface of the competent rock until it reaches a point where the rock outcrops produce a spring or seep. A strong correlation exists between rainfall and production from springs and seeps in the area (Meinzer, 1911). A perched water table was reported to exist 100 feet to 650 feet deep in igneous rocks (UOS, 2001b).

Several wells and infiltration galleries are situated in the unconsolidated sediments on both sides of the Eureka–Homansville Pass, located approximately one mile east of Eureka. The upper part of both of these valleys is underlain by igneous rocks. This area is broad, open, and is mantled with weathered igneous rock and sediments carried down from the mountain sides. Relatively large quantities of water are obtained from this area through large vertical shafts and horizontal drifts that afford extensive infiltration surfaces (Meinzer, 1911).

Eureka has many private wells completed to depths ranging from 15 to 125 feet. Most of these wells extend to the hard rock or are sunk a short distance into the rock. They derive meager supplies of water from seepage near the bottom of loose materials on top of the aquaclude (Meinzer, 1911). Depth to groundwater varies from 35 feet to several hundred feet below ground surface (UDEQ, 2000).

4.5 Sampling Results

Sampling programs performed in the latter half of 2000 confirmed that metals are present in the mine waste piles, in residential and non-residential soils, and within the interiors of some residences and commercial buildings. Properties that are currently developed as homesites, vacant properties interspersed among homesites, and commercial properties are categorized as residential.

The few commercial properties in Eureka have been included in the residential category because they are interspersed among residential properties, and the areas are frequented by neighborhood children. Lead is the primary contaminant of concern for soils; however, other metals, including arsenic, are also present. Dust samples collected from building interiors demonstrated that both lead and arsenic are present in some homes.

Over 4,205 soil samples were collected from 505 residential and commercial properties. Approximately 100 residential properties contain surface soil lead in concentrations greater than 3,000 ppm (parts per million). An additional 350 residential properties show surface soil lead concentrations at levels between 231 and 2,999 ppm. The maximum lead concentration detected in surface soils was 18,000 ppm. At depth (12 -18 inches), approximately 50% of the parcels contain lead between 231 ppm and 2,999 ppm. Fewer than 10% contain lead greater than 3,000 ppm, while the remaining parcels contain lead at levels less than 231 ppm. The maximum lead level detected at 12-18 inches was 15,000 ppm.

Samples were also collected from mine waste piles and areas with the potential for future development. Lead concentrations within the waste pile material ranged from 1,000 ppm to 47,806 ppm, while lead in the potential future development areas ranged from 325 ppm to 15,000 ppm. Several of the mine waste piles are within 5 to 20 yards of residential properties. The waste piles exhibiting the highest levels of contamination are the Mayday Shaft to the southeast of town, the Chief Mill No. 1 at the southern edge of town, the Eagle and Bluebell Mine to the southwest of town, and the Gemini at the western edge of town.

5.0 SUMMARY OF SITE RISKS

5.1 Introduction

A Baseline Human Health Risk Assessment (BHHRA) was conducted to evaluate the current and future human health risks associated with metals present in soils within the Site (SRC, 2002). The baseline risk assessment estimates what risks the Site poses if no action were taken. The results of the risk assessment are used in evaluating whether remedial action is needed. It provides the basis for taking actions and identifies the contaminants and exposure pathways that need to be addressed by the remedial action.

An ecological risk assessment has not yet been performed at this Site since the acute risks to human health posed by the site contamination are the Agency's primary focus at this time. A screening ecological risk assessment will be performed once remedial action is underway to address the human health concerns.

5.2 Conceptual Site Model

Figure 5-1 presents the Conceptual Site Model (CSM) on which the *Baseline Human Health Risk Assessment* and the remedial actions presented in this ROD are based. The primary exposure route identified in the CSM is ingestion of soil and dust. This exposure route is often one of the most important routes of human intake of contaminated soil. Most people, especially children, ingest small amounts of soil that adhere to the hands or other objects. In addition, outdoor soil can enter the home and mix with indoor dust, which may be ingested during meals or hand-to-mouth activities. Conversely, the pathway of dermal contact with contaminated soil is likely to be minor in comparison to the amount of exposure that occurs by soil and dust ingestion. Inhalation exposure was also determined to be a very small source of risk (less than 0.2%) compared to incidental ingestion of soil. Exposure to soil contaminants via consumption of home-grown vegetables was not fully evaluated due to lack of site-specific data. Models used in the risk assessment indicated that ingestion of locally grown vegetables was a minor contribution to the overall risk.

5.3 Human Health Risk Assessment

Results of the risk assessment are summarized in this section. Data collected during the Removal Preliminary Assessment (RPA) was used for the risk assessment. Exposure scenarios of potential concern were determined to be (1) residential areas within Eureka affecting the current residents and (2) non-residential areas affecting current recreational visitors and hypothetical future residents and recreational visitors. Two types of exposures were further evaluated for each scenario: the average or central tendency exposure (CTE), referring to individuals who have average intake of environmental media, and the reasonable maximum exposure (RME), referring to people who are at the high end of the exposure distribution. Table 5-1 provides a summary of exposure scenarios and exposure routes.

5.3.1 Chemicals of Potential Concern

The contaminants of potential concern (COPCs) were determined for soils. The COPCs are analytes which EPA chooses to evaluate further in a risk assessment. The COPCs were selected through an evaluation of essential nutrients, detection frequencies, comparison with background concentrations (soils only) and a toxicity/concentration screening. Table 5-2 presents the COPCs selected for quantitative evaluation for the Site.

5.3.2 Non-Lead Risks

Exposure and risks from non-lead COPCs were evaluated using standard EPA methods. All exposure and toxicity factors for the varying exposure scenarios, as well as exposure point concentration calculations, are described in Section 4 of the final BHHRA (SRC, 2001). Residential exposure areas were determined by dividing the residential portion of Eureka into six areas of approximately equal size. Risks from exposure to soils and dust were evaluated within each of the areas, as well as across the site as a whole. Because the City of Eureka is supplied by a municipal water system, no exposure areas were designated for this media.

The non-residential areas were divided into seven exposure areas, based primarily on geographic location, to represent exposure areas for recreational activities.

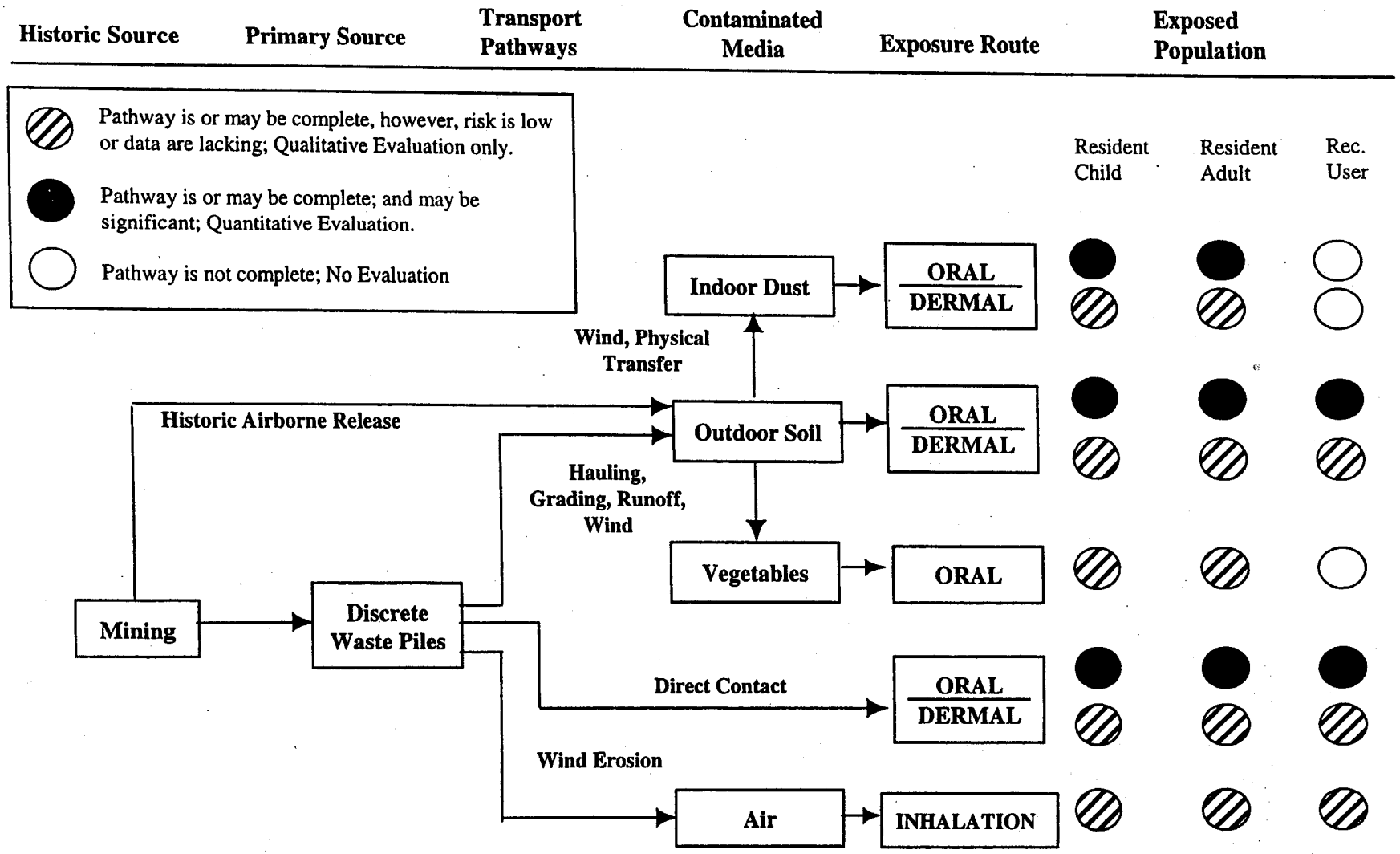
Non-cancer risks are described in terms of a Hazard Quotient (HQ). The HQ represents a ratio of the dose at the Site divided by a dose believed to be safe. An HQ equal to or less than 1 indicates that there is no appreciable risk of non-cancer health effects occurring. Conversely, an HQ greater than 1 indicates a possibility that non-cancer risks may occur, although an HQ above 1 does not indicate an effect will definitely occur. However, the larger the HQ value, the more likely it is that an adverse health effect may occur.

Cancer risks are described by the probability that an exposed individual will develop cancer due to exposure by age 70. EPA's risk management range for potential excess cancer risks is $1x10^{-4}$ to $1x10^{-6}$ (100 per million to 1 in one million). Arsenic was the only COPC identified as a carcinogen by the oral route of exposure.

5.3.2.1 Residential Areas

As shown in Table 5-3, the summed risks for residential soil ingestion for the Reasonable Maximum Exposure (RME) scenarios exceed the HQ value of 1.0 in exposure areas 1,2,3,4 and 5 with the majority of the risk attributable to arsenic and thallium. However, contributions from each individual chemical did not exceed an HQ of 1. Across the Site as a whole, (all areas) RME values exceed the 1.0 level of concern, but average exposures are below an HQ of 1. With respect to excess cancer risks to residents, exposure to arsenic resulted in exceedances of 100 per million level of concern in exposure areas 3, 4, and 5 (range 101 to 111 per million) under RME exposure scenarios.

Figure 5-1: Conceptual Site Model for Residential Exposure to COPCs



Non-cancer risk estimates based upon ingestion of tap water show that risks are less than an HQ of 1. Excess cancer risks did not exceed a value of 100 per million level, even under RME exposure assumptions.

5.3.2.2 Nonresidential Areas

For recreational visitors, the summed non-cancer risk values exceed an HQ of 1 at all evaluated exposure areas under both average and RME exposure assumptions. As shown in the Table 5- 4, the elevated risk is primarily attributable to arsenic. However, at some locations, risks from antimony, mercury, and thallium were also elevated. Excess cancer risks were not found to exceed 100 cases per million for average recreational users at any of the non-residential exposure areas. However, under RME exposure assumptions, cancer risks ranged from 349 to 719 per million.

For potential future residents, chemicals in all of the evaluated exposure areas have summed non-cancer and cancer risks exceeding a level of concern under both average and RME exposure scenarios. Risks in the majority of these areas are attributable to arsenic, however in some instances, risks from antimony and thallium also exceed an HQ of 1.0.

5.3.3 Lead Risks

Risks from lead are usually evaluated by estimating the blood lead levels in exposed individuals and comparing those levels to health-based guidelines. In the case of residential exposure, the population of chief concern is children under the age of 7 years. EPA has set a goal that there should be no more than a 5% chance that a child should have a blood lead value over 10 µg/dL. The probability of exceeding a blood lead value of 10 µg/dL is referred to as P10.

Blood lead levels in an exposed population of children may be measured either directly, or may be calculated using a mathematical model. Each of these approaches has strengths and weaknesses, so both of these approaches were used at the Site.

5.3.3.1 Current and Future Residents

EPA's Integrated Exposure, Uptake and Biokinetic (IEUBK) model was used to assess the risks of lead exposure in residential children. The model evaluates the distribution of blood lead values that would be expected in a population of children living at a specific location to determine whether the risks to any random child living at a specific location, in order to judge whether the risks to any random child living at that location are within health based goals. The model was run for each residence within Eureka and each non-residential property for which environmental data were collected.

The predictions of the IEUBK model for current residential children are shown in Table 5-5. As seen, geometric mean blood lead levels for residential properties are predicted to range from 5.1 µg/dL to 47 µg/dL, with relatively little difference observed across exposure areas. Based on a GSD of 1.6 (default), the 95th percentile blood lead values were predicted to range between 11 µg/dL and

101 µg/dL, with a community-wide average of 33 µg/dL. Based on this, 100% of all properties are above EPA's health-based goal (P10<5%), and the predicted incidence of children with blood lead levels greater than 10 µg/dL is 69%. Even if a lower GSD (1.4) is assumed, the risks of elevated blood lead levels still exceeds EPA's target at most properties, with a predicted incidence of 99%. These results indicate that current risks to children from lead is likely to be well above EPA's health-based goal in nearly all locations at this site.

The resulting predictions of the IEUBK model for hypothetical future residential children are presented in Table 5-6. As shown, the average predicted geometric mean blood lead concentration across all properties was 33.4 µg/dL (range 6-81.5 ug/dL). Regardless of the GSD used (1.4 or 1.6), all properties (100%) were found to have P10 exceeding 5%, including those properties targeted for potential future development.

5.3.3.2 Recreational Visitors

The Bower's model was used to evaluate lead risks to teenage recreational visitors. This model predicts the blood level in an adult by summing the "baseline" blood level (that which would occur in the absence of any above-average site-related exposure) with the increment in blood lead that is expected as a result of increased exposure due to contact with a lead-contaminated site medium.

The predicted geometric mean blood leads and the 95th percentile blood lead values for recreational visitors exposed at different locations are summarized in Table 5-7. As shown, predicted geometric mean blood lead concentrations ranged from 2.8 to 98 µg/dL (average 24 µg/dL) and the 95th blood lead values ranged from 7 to 259 ug/dL (average 64 µg/dL). Because EPA has not issued formal guidance on the blood lead level considered protective for pregnant women or other adults, the results of the Bower's model were interpreted using a health criterion that there should be no more than a 5% chance that the blood level of a fetus will be above 10 µg/dL. This is equivalent to a blood lead concentration of 11.1 µg/dL in an adult.

A comparison of the 95th percentile blood lead levels predicted for site visitors shows that recreational use at 22 of the 24 properties evaluated may result in blood lead levels that exceed the target concentration of 11.1 µg/dL.

5.3.4 Measured Blood Lead Values

During the year 2000, a total of 227 Eureka residents participated in a blood lead monitoring study (SRC, 2001). Table 5-8 presents blood lead summary statics for the study participants, stratified by age. Observed blood lead concentrations ranged from 0.9 µg/dL to 42.4 µg/dL, with a geometric mean of 4.4 µg/dL. Of the participants, 35 (~15%) were found to have elevated blood lead levels (>10 µg/dL). A comparison of site blood concentrations to nationwide statistics show that geometric mean blood lead levels in children in Eureka (3.1 µg/dL to 9.1 µg/dL) are higher than the corresponding national geometric mean blood lead values (1.6 µg/dL to 4.1 µg/dL) for this age bracket.

To determine if the IEUBK model and measured blood lead concentrations were in agreement, the BHHRA compared the predicted blood lead levels for children under the age of 6 years to those measured through the study. Table 5- 9 presents the results of the comparison. As shown in the table, the model did not accurately predict values similar to those observed in children from this site, rather the pattern appears to be highly variable. An evaluation of the model residuals found that the IEUBK model was tending to systematically overestimate the contribution of soil and dust to a child's blood lead level.

As shown in Table 5-9, 20 out of 59 children (34%) were observed to have elevated blood leads based on biomonitoring, whereas using a GSD of 1.4 or 1.6, the IEUBK model predicts that 50.3% and 50.6% of this subset of children will have elevated blood leads, respectively. Therefore, both the measured and modeled results suggest that elevated blood leads are of concern at this site.

5.4 Current and Potential Future Land Use

Current and potential future site use includes residential, commercial, and recreational use within the City of Eureka and surrounding mining areas. Residents are assumed to be the primary population exposed to contaminated soil under current and anticipated future land uses. These site uses will not change as a result of the Selected Remedy.

5.4.1 Residential Land Use and Lead Exposure Risk

Risks from lead are evaluated by estimating the blood lead levels in exposed individuals and comparing those estimates to health-based guidelines. In a residential setting, children under the age of 7 years are the group most at risk for exposure to lead. EPA recommends that there should be no more than a 5% chance of a child having a blood-lead level higher than 10 µg/dL. In its risk assessment, EPA used a model that predicted that 99-100% of the children in Eureka would have greater than a 5% chance of exceeding a blood lead level of 10 µg/dL. This was based on the high lead levels in the soils at most residences in Eureka and the high bioavailability of the lead form, as well as behaviors identified in the survey completed with the blood lead testing. Currently measured blood lead levels indicate that 20 out of 59 children under the age of 6 years have blood lead greater than 10 µg/dL.

Based upon the Integrated Exposure, Uptake and Biokinetic (IEUBK) Model and the Integrated Stochastic Exposure Model for the 505 properties evaluated, the *Baseline Human Health Risk Assessment* (SRC, 2001) concludes that "current risk to children from lead is likely to be well above EPA's health-based goal in nearly all locations at the site." EPA has identified 10 µg/dL as the blood lead level at which health effects that warrant avoidance begin to occur and has set a goal that there should be no more than a 5% chance that any child will have a blood lead value above 10 µg/dL (P10 < 5%) (EPA, 1994a and EPA, 1994b).

5.4.2 Recreational Land Use and Lead Exposure Risk

The risk assessment also evaluated the risk to teenagers and adults involved in recreational activities around Eureka. The risk assessment showed that the lead levels in the soils at most of the non-residential areas around Eureka could increase the chance of higher blood lead levels in teenagers and adults engaged in recreational activities (e.g., dirt bike riding on dusty trails). In the blood lead testing, 13% of children ages 7 to 18 in Eureka also had elevated blood lead levels. For the 24 outlying properties (potential future residential development and non-residential sites) that were evaluated based upon the Bower's Model, the risk assessment concluded that "a comparison of the 95th percentile blood lead levels predicted for site visitors show that recreational use at 22 of the 24 properties evaluated may result in blood lead levels that exceed a target concentration of 11.1 µg/dL. These results show that the majority of these areas could pose a risk of elevated blood lead levels to recreational visitors."

5.5 Preliminary Remediation Goals

Both residential and recreational risk scenarios were used to develop Preliminary Remediation Goals (PRGs) for the Site. These PRGs are determined through the risk assessment process, which evaluates both potential cancer and non-cancer risks associated with a contaminant. The resulting PRGs represent contaminant levels that are deemed protective of human health. Preliminary Remediation Goals for the Site are presented in Table 5- 10.

The residential PRG of 231 parts per million (ppm) lead in soils is applicable for residential homes, vacant lots adjacent to residential properties and commercial properties. The residential PRGs developed for the remaining COPCs are 110 ppm antimony, 77.4 ppm arsenic, 82 ppm mercury, and 22 ppm thallium. These metals are less prevalent and are generally co-located with areas of lead contamination. The recreational PRG of 735 ppm lead in soils is applicable to the discrete mine waste piles and to areas that are currently used as recreational but are designated as areas of potential future development. The recreational PRGs developed for the remaining COPCs are 86 ppm antimony, 118 ppm arsenic, 65 ppm mercury, and 17 ppm thallium.

Table 5-1

Exposure Scenarios of Potential Concern

Location	Population	Medium and Exposure Route
Residential Areas within Eureka	Current Residents	• Incidental ingestion of soil and dust
Non-Residential Areas	Hypothetical Future Residents	• Incidental ingestion of soil and dust
Non-Residential Areas	Recreational Visitors	• Incidental ingestion of soil

Table 5-2

Contaminants of Potential Concern

Chemical	Soil COPC
Antimony	X
Arsenic	X
Cadmium	X
Iron	X
Lead	X
Manganese	X
Mercury	X
Silver	X
Thallium	X

Table 5-3: Risk Estimates for Residential Soil Ingestion (by area)

Part A: Evaluation of Chronic Non-Cancer Risk

Analyte	All Areas		Area 1		Area 2		Area 3		Area 4		Area 5		Area 6	
	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME
Antimony	3.0E-02	8.5E-02	3.4E-02	9.4E-02	1.5E-02	4.2E-02	3.0E-02	8.5E-02	1.3E-02	3.8E-02	2.8E-02	7.9E-02		
Arsenic	1.5E-01	4.3E-01	1.8E-01	4.9E-01	1.4E-01	4.0E-01	1.9E-01	5.2E-01	2.1E-01	5.7E-01	2.0E-01	5.6E-01		
Cadmium	1.5E-02	4.3E-02	1.8E-02	5.0E-02	1.3E-02	3.7E-02	3.2E-02	9.0E-02	2.0E-02	5.6E-02	2.1E-02	5.9E-02		
Iron	5.9E-02	1.6E-01	6.4E-02	1.8E-01	5.6E-02	1.6E-01	3.1E-02	8.8E-02	6.5E-02	1.8E-01	6.3E-02	1.8E-01	3.7E-02	1.0E-01
Manganese	6.5E-03	1.8E-02	7.7E-03	2.1E-02	6.3E-03	1.8E-02	8.0E-03	2.2E-02	7.1E-03	2.0E-02	7.4E-03	2.1E-02		
Mercury	5.7E-03	1.6E-02	6.4E-03	1.8E-02	4.3E-03	1.2E-02	6.1E-03	1.7E-02	9.0E-03	2.5E-02	1.1E-02	3.0E-02		
Silver	1.7E-03	4.6E-03	1.9E-03	5.4E-03	1.5E-03	4.2E-03	2.2E-03	6.3E-03	2.0E-03	5.5E-03	2.7E-03	7.7E-03		
Thallium	2.3E-01	6.4E-01	2.7E-01	7.7E-01	1.9E-01	5.4E-01	2.0E-01	5.6E-01	2.3E-01	6.4E-01	2.2E-01	6.1E-01		
Total	5E-01	1E+00	6E-01	2E+00	4E-01	1E+00	5E-01	1E+00	6E-01	2E+00	6E-01	2E+00	4E-02	*1E-01*

Part B: Evaluation of Cancer Risk

Analyte	All Areas		Area 1		Area 2		Area 3		Area 4		Area 5		Area 6	
	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME
Arsenic	8.9E-06	8.3E-05	1.0E-05	9.5E-05	8.3E-06	7.7E-05	1.1E-05	1.0E-04	1.2E-05	1.1E-04	1.2E-05	1.1E-04		
Total	9E-06	8E-05	1E-05	1E-04	8E-06	8E-05	1E-05	1E-04	1E-05	1E-04	1E-05	1E-04		

Blank cells indicate no data is available to evaluate risk.

Table 5-4: Risk Estimates at Non-Residential Areas

RECREATIONAL USER: Part A: Evaluation of Chronic Non-Cancer Risk

Analyte	Area A		Area B		Area C		Area D		Area E		Area F		Area G	
	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME
Antimony	1.8E-02	1.5E-01			4.2E-03	3.4E-02	1.2E-02	9.3E-02	5.7E-02	4.5E-01	1.4E-02	1.1E-01		
Arsenic	8.0E-02	6.4E-01			6.7E-02	5.4E-01	1.1E-01	8.6E-01	1.4E-01	1.1E+00	1.4E-01	1.1E+00		
Cadmium	1.2E-02	9.4E-02			9.3E-02	7.5E-02	4.1E-03	3.2E-02	1.1E-02	8.6E-02	7.7E-03	6.1E-02		
Iron	7.9E-03	6.4E-02												
Manganese	1.2E-03	9.9E-03			1.6E-03	1.3E-02	6.0E-04	4.8E-03	2.8E-03	2.3E-02	1.7E-03	1.4E-02		
Mercury	1.4E-03	1.1E-02			1.1E-03	8.6E-03	3.3E-02	2.6E-01	1.4E-03	1.2E-02	2.7E-04	2.2E-03		
Silver	1.5E-03	1.2E-02			1.5E-03	1.2E-02	1.2E-03	9.9E-03	8.6E-04	6.9E-03	1.9E-03	1.5E-02		
Thallium	4.3E-02	3.5E-01			5.2E-02	4.2E-01	5.9E-03	4.7E-02	5.8E-02	4.6E-01	2.0E-02	1.6E-01		
Total	2E-01	1E+00			1E-01	1E+00	2E-01	1E+00	3E-01	2E+00	2E-01	1E+00		

RECREATIONAL USER: Part B: Evaluation of Cancer Risk

Analyte	Area A		Area B		Area C		Area D		Area E		Area F		Area G	
	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME
Arsenic	1.5E-06	2.5E-05			1.3E-06	2.1E-05	2.1E-06	3.3E-05	2.6E-06	4.2E-05	2.7E-06	4.3E-05		
Total	2E-06	2E-05			1E-06	2E-05	2E-06	3E-05	3E-06	4E-05	3E-06	4E-05		

Table 5-4: Risk Estimates at Non-Residential Areas (cont.)

FUTURE RESIDENTIAL: Part A: Evaluation of Chronic Non-Cancer Risk

Analyte	Area A		Area B		Area C		Area D		Area E		Area F		Area G	
	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME
Antimony	2E-01	53-01			4E-02	1E-01	1E-01	3E-01	6E-01	2E+00	1E-01	4E-01		
Arsenic	8E-01	2E+00			7E-01	2E+00	1E+00	3E+00	1E+00	4E+00	1E+00	4E+00		
Cadmium	1E-01	3E-01			9E-02	3E-01	4E-02	1E-01	1E-01	3E-01	8E-02	2E-01		
Iron	8E-02	2E-01												
Manganese	1E-02	4E-02			2E-02	5E-02	6E-03	2E-02	3E-02	8E-02	2E-02	5E-02		
Mercury	1E-02	4E-02			1E-02	3E-02	3E-01	9E-01	1E-02	4E-02	3E-03	8E-03		
Silver	2E-02	4E-02			2E-02	4E-02	1E-02	4E-02	9E-03	2E-02	2E-02	5E-02		
Thallium	4E-01	1E+00			5E-01	1E+00	6E-02	2E-01	6E-01	2E+00	2E-01	6E-01		
Total	2E+00	5E+00			1E+00	4E+00	2E+00	5E+00	3E+00	8E+00	2E+00	5E+00		

FUTURE RESIDENTIAL: Part B: Evaluation of Cancer Risk

Analyte	Area A		Area B		Area C		Area D		Area E		Area F		Area G	
	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME	Avg	RME
Arsenic	4.7E-05	4.4E-04			3.9E-05	3.7E-04	6.4E-05	5.9E-04	8.0E-05	7.4E-04	8.1E-05	7.6E-04		
Total	*5E-05*	*4E-04*			*4E-05*	*4E-04*	*6E-05*	*6E-04*	*8E-05*	*7E-04*	*8E-05*	*8E-04*		

Table 5-5

Summary Statistics for the IEUBK Model

All Residential Properties

					GSD 1.6		GSD 1.4	
Area	**Count**	**Min Pb**	**Max Pb**	**Avg Pb**	**Avg P10**	**P10>5%**	**Avg P10**	**P10>5%**
1	218	6.1	46.6	14.8	69.2	100%	72.1	100%
2	93	5.1	25.3	11.3	53.2	100%	53.6	96%
3	6	5.1	27.7	14.4	56.5	100%	55.5	83%
4	116	5.5	42.7	17.6	77.3	100%	80.6	98%
5	61	5.9	43.2	16.5	74.6	100%	78.3	100%
6	11	6.9	33.9	16.6	74.4	100%	78.7	100%
Total	505	5.1	46.6	15.0	68.7	100%	71.3	99%

Table 5-6

IEUBK Results for Future Residential Children at Non-Residential Areas

Outside Area	Predicted PbB (µg/dL)	P10 (%)	
		GSD = 1.6	GSD = 1.4
1	--	--	--
2	8.0	32	26
3	24.2	97	100
4	42.7	100	100
5	81.5	100	100
6	17.1	87	94
7	38.6	100	100
8	33.4	99	100
9	51.0	100	100
10	26.6	98	100
11	53.3	100	100
12	17.5	88	95
13	38.3	100	100
14	43.6	100	100
15	18.2	90	96
16	41.3	100	100
17	32.8	99	100
18	37.7	100	100
19	27.2	98	100
20	57.5	100	100
21	26.2	98	100
22	33.2	99	100
23	6.3	16	8
24	18.2	90	96
25	26.4	98	100
AVG	**33.4**	**91.3**	**92.3**

Table 5-7
Bower's Model Predictions for Recreational Visitors

Area	Avg Surface Concentration (ppm)	GM PbB (µg/dL)	95th Percentile PbB (µg/dL) GSD=1.8
01	–	–	–
02	615	3.5	9.1
03	4,694	12.6	33.2
04	13,261	31.8	84
05	42,987	98.4	259
06	2,584	7.9	20.7
07	10,989	26.7	70
08	8,404	20.9	55.0
09	18,506	43.6	115
10	5,556	14.5	38.2
11	20,041	47.0	124
12	2,682	8.1	21.3
13	10,827	26.4	69.3
14	13,827	33.1	87
15	2,881	8.6	22.5
16	12,479	30.1	79
17	8,121	20.3	53.4
18	10,546	25.7	67.6
19	5,811	15.1	39.8
20	23,039	53.7	141
21	5,439	14.3	37.6
22	8,344	20.8	54.7
23	313	2.8	7.4
24	2,868	8.5	22.4
25	5,491	14.4	37.9
All	**10,013**	**24.5**	**64.5**

Table 5-8

Blood Lead Summary Statistics

Age	Eureka						NHANES	
	N	GM	Min	Max	N>10	%>10	GM	%>10
<1	3	5.0	3	9.5	0	0.0	--	--
1-2	17	9.1	2.5	18.5	8	47.1	4.1	11.5
3-5	31	7.2	1.6	32.2	10	32.3	3.4	7.3
6-11	50	6.6	1.8	42.4	13	26.0	2.5	4.0
12-19	32	3.1	0.9	21	2	6.3	1.6	1.6
20-49	65	2.6	0.9	35.1	1	1.5	2.6	3.3
50-69	20	3.9	0.9	12.7	1	5.0	4	7.0
>70	5	2.8	1.2	6.7	0	0.0	4	6.3
ALL	**227**	**4.4**	**0.9**	**42.4**	**35**	**15.4**	**2.8**	**4.5**

Table 5-9

Observed and Predicted Blood Lead in Children

Area	Children Tested	Children with PbB>10	Avg PbB (µg/dL)	Predicted Avg PbB (µg/dL)	GSD 1.6		GSD 1.4	
					Avg P10 (%)	P10>5	Avg P10 (%)	P10>5
1	33	12	8.8	12.2	59.6	94%	61.7	94%
2	15	5	10.6	8.2	32.7	93%	29.6	80%
3	0	–	–	–	–	–	–	–
4	6	1	7.2	10.9	49.0	100%	48.8	100%
5	5	2	8.0	9.2	42.9	100%	42.4	80%
6	0	–	–	–	–	–	–	–
Total	59	20	9.1	10.8	50.3	95%	50.6	90%

Table 5-10

Preliminary Remediation Goals for the Eureka Mills NPL Site

Chemical	Residential Areas (Based on Residential Exposure)	Mine Waste/Non-Residential Areas (Based on Recreational Exposure)
Antimony (ppm)	110	86
Arsenic* (ppm)	77.4	118
Lead (ppm)	231	735
Mercury** (ppm)	82	65
Thallium (ppm)	22	17

* The PRG for arsenic is based on 1E-04 for a cancer risk level.

** The PRG for mercury is based on an Hazard Index of 1.0 for a non-cancer risk level.

6.0 REMEDIAL ACTION OBJECTIVES

6.1 Need for Remedial Action

Based on the results of the BHHRA and elevated blood lead levels in Eureka, EPA and UDEQ determined that implementation of remedial actions are necessary to reduce local residents' exposure to lead in the environment. Arsenic was determined to pose an excess cancer risk, while antimony, mercury and thallium exceed an HQ of 1. EPA's IEUBK model predicted that geometric mean blood lead levels for children ranged from 5.1 to 47 µg/dL based on a GSD of 1.6. The predicted risk is supported by the results of blood lead testing identifying over 30 children with blood lead levels >10 µg/dL. The response actions selected in this ROD are necessary to protect the public health from actual releases of hazardous substances into the environment. Because antimony, arsenic, mercury and thallium are co-located with lead in the soils, soil removal in the residential areas and capping of the mine waste piles will also address these other metals.

6.2 Remedial Action Objectives

Residents are the primary population exposed to contaminated soil under current and anticipated future land uses. The overall remedial action objective of this ROD is to reduce the exposure of local residents, in particular, children under the age of seven years, to lead found in the environment.

EPA has identified 10 µg/dL as the blood lead level at which adverse health effects begin to occur and has set a goal that there should be no more than a 5% chance that any child will have a blood lead value above 10 µg/dL (P10 < 5%) (EPA, 1994a and EPA, 1994b).

The remedial action objectives for final cleanup of contaminated soils within OUs 00 through 3 address the risks to human health as defined in the *Baseline Human Health Risk Assessment* (SRC, 2001):

- Prevent exposure of children to lead in surface soil within current residential properties, vacant properties interspersed among residential properties, and commercial properties at the Site where soil is determined to be the source of lead and the ingestion of soil is predicted to result in a greater than 5% chance that an individual child or a group of similarly exposed children will have a blood lead level greater than 10 µg/dL.

- Prevent exposure of adolescents and adults engaging in recreational activities to lead in surface soil within discrete mine waste piles and non-residential properties (areas currently used for recreation but proposed for future development) at the Site where ingestion of soil is predicted to result in a greater than 5% chance that an individual or a group of similarly exposed individuals will have a blood lead level greater than 11.1 µg/dL.

6.3 Summary of ARARs

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA section 121(d)(4).

Applicable requirements are those cleanup standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to a particular site. Only those state standards that are identified in a timely manner and are more stringent than federal requirements may be relevant and appropriate.

EPA has developed guidance for identifying ARARs in *CERCLA Compliance with Other Laws Manual* (EPA, 1988b). This guidance defines three categories of ARARs:

- Ambient, chemical-, or contaminant-specific requirements: These are usually health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment.

- Location-specific requirements: These are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they occur in specific locations.

- Performance-, design-, or other action-specific requirements: These are usually technology- or activity-based requirements for or limitations on remedial actions.

Contaminant-, location-, and action-specific ARARs are listed in Table 6-1 and are discussed below:

- Contaminant-specific ARARs: The potential contaminant-specific ARARs are the State of Utah fugitive dust standards. All alternatives, with the exception of the No Action Alternative, must comply with fugitive dust standards. National Ambient Air Quality Standards were reviewed and were deemed not applicable because the remediation would not be a new major source as defined in the Clean Air Act, however, they may be relevant and appropriate.

- Action-specific ARARs: Potential action-specific ARARs include requirements for fugitive dust and emissions; water discharge standards; storm water management; risk-based closure;

solid waste treatment, storage, and disposal; and hazardous waste treatment, storage, and disposal. Hazardous waste identification, generator, and container storage requirements will apply if any hazardous (non-Bevill) waste is discovered during cleanup.

Because the Site wastes are not mineral processing wastes (i.e. non-Bevill waste), this ARARs analysis assumes that the hazardous waste regulations do not apply. The Utah solid waste regulations do not include a definition of solid waste. However, Utah Code 19-6-102 (17) defines the term "solid waste" as including mining wastes, with the exception of mining wastes generated by the extraction, beneficiation, or processing of ores and minerals, unless the waste causes a public nuisance or public health hazard or is otherwise determined to be a hazardous waste. Therefore, the solid waste regulations are designated as applicable.

- Location-specific ARARs: Potential location-specific ARARs include requirements for compliance with acts and regulations that protect historical, archeological, and natural features; wetlands; wildlife; flood plains; and endangered or threatened species habitat. EPA conducts programmatic evaluations of historic and archeological resources for remedial actions. As the solid waste regulations apply, there are location specific standards for solid waste landfills, solid waste piles (as defined under UAC R315-301-2), and land treatment disposal units.

Table 6-1
Regulatory Requirements for Eureka Mills CERCLA Action

Potential Contaminant-Specific Requirements				
Requirement	**Criteria**	**Prerequisite**	**Citation**	**ARARS Determination**
Air Emissions: Fugitive Emissions and Fugitive Dust	Fugitive emissions shall not exceed 20% opacity. Construction and demolition activities, roads and aggregate materials must be managed to minimize fugitive dust.	Applies to fugitive emissions from sources constructed after 4-25-71. Applies to all activities that generate fugitive dust.	Utah Air Conservation Act, UCA 19-2; UAC R307-205-2; UAC-R307-205-3 UAC-R307-205-5	Applicable. May be Relevant & Appropriate as it applies to soil borrow areas.
Air Emissions: General Emission Standards	Visible emissions shall be a shade or density no darker than 20% opacity.	Applies to installations constructed after 4-25-71.	Utah Air Conservation Act, UCA 19-2; UAC R307-201-1(2)	Applicable.
Air Emissions	Air emissions must not cause or significantly contribute to an exceedance of the National Ambient Air Quality Standards for particulate matter: • PM2.5: 65 micrograms per cubic meter ($\mu g/m^3$) 24-hour and 15.0 $\mu g/m^3$ annual • PM10: 150 $\mu g/m^3$ 24-hour and 50 $\mu g/m^3$ annual • Lead (quarterly average): 1.5 $\mu g/m^3$	Applies to new major sources.	Clean Air Act, 40 CFR Part 50	Relevant and appropriate.
Potential Action-Specific Requirements				
Action	**Criteria**	**Prerequisite**	**Citation**	**ARARs Determination**
Construction and Excavation: Storm Water	Requirements to ensure storm water discharges do not contribute to a violation of surface water quality standards. Includes measures to minimize and/or eliminate pollutants in storm water discharges and monitoring to demonstrate compliance.	Applies to discharges of storm water associated with construction activity (clearing, grading, or excavation) involving the disturbance of 5 acres or more.	Utah Water Quality Act, UCA 19-5; UAC R317-8-3.9	Applicable.

Table 6-1
Regulatory Requirements for Eureka Mills CERCLA Action

Potential Action-Specific Requirements				
Action	**Criteria**	**Prerequisite**	**Citation**	**ARARs Determination**
General Earthwork & Construction	Establishes requirements for a construction quality assurance program	Establishes requirements for a construction quality assurance program to ensure that constructed units meet or exceed all design criteria.	UAC R315-8-2.10	Relevant & Appropriate for closure of non-hazardous waste repository, including Beville exempt waste.
General Earthwork & Construction	Air Pollution Prohibited	Emission of air contamination in sufficient quantities to cause air pollution is prohibited.	UAC R307-102-1	Applicable
Risk-Based Closure	Establishes a streamlined approach for determining protective levels for lead in soil at CERCLA and RCRA sites.	Focuses on lead in soil from sources other than lead-based paint.	Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities, EPA Directive #9355.4-12; Clarification to the 1994 Revised Interim Soil Lead Guidance, EPA Directive 9200.4-27	To be considered.
Risk-Based Closure	Establishes requirements to support risk-based closure at sites for which remediation or removal of hazardous constituents to background levels will not be achieved.	Applies to any responsible party involved in management of a site contaminated with hazardous waste or hazardous constituents.	Utah Solid and Hazardous Waste Act, UCA 19-6; UAC R315-101	Relevant and appropriate.
Remediation and Repository Closure	Provides cleanup standards evaluation criteria for corrective actions.	Applies to CERCLA sites located within the state of Utah.	Utah Solid and Hazardous Waste Act, UCA 19-6; UAC R311-211-5;UAC R311-211-6	Relevant and appropriate.
Site Reclamation	Establishes requirements for reclamation of mine sites and mine waste.	Applies to operational mines within the state of Utah.	Utah Mined Lands Reclamation Act (Non-Coal Reclamation Rule), UCA 40-8; UAC R647-3; UAC R647-4	Relevant and appropriate.
Solid Waste Treatment and Disposal	Establishes regulations for management of solid wastes.	Applies to solid waste disposal.	Utah Solid and Hazardous Waste Act, UCA 19-6; UAC R315-301- 6	Relevant and appropriate.

Table 6-1
Regulatory Requirements for Eureka Mills CERCLA Action

Potential Action-Specific Requirements				
Action	**Criteria**	**Prerequisite**	**Citation**	**ARARs Determination**
Solid Waste Treatment and Disposal	Provides solid waste location standards, general facility requirements, and closure requirements.	Applies to management of solid waste.	Utah Solid and Hazardous Waste Act, UCA 19-6; UAC R315-302	Relevant and appropriate with respect to certain location and closure requirements
Solid Waste Disposal	Provides solid waste landfilling standards.	Applies to landfilling solid waste.	Utah Solid and Hazardous Waste Act, UCA 19-6; UAC R315-303 (3)	May be relevant and appropriate to certain requirements for a nonhazardous solid waste cover design. Reduction of infiltration is not necessary for the cover type that will be constructed.
Hazardous Waste Management: Identification	Outlines requirements for identifying hazardous waste.	Applies to RCRA hazardous waste.	Utah Solid and Hazardous Waste Act, UCA 19-6; UAC R315-2	Applicable only if any hazardous waste is generated; may be relevant and appropriate in other instances.
Hazardous Waste Management: Generator Requirements	Outlines requirements for hazardous waste generators	Applies to RCRA hazardous waste.	Utah Solid and Hazardous Waste Act, UCA 19-6; UAC R315-5	Applicable only if any hazardous waste is generated & being transported off-site; may be relevant and appropriate in other instances.
Hazardous Waste Container Storage	Establishes standards for management of hazardous waste in containers before shipment to a treatment, storage or disposal facility.	Applies only to RCRA hazardous waste.	Utah Solid and Hazardous Waste Act, UCA 19-6; UAC R315-8-9	Applicable only if any hazardous waste is generated.

Table 6-1
Regulatory Requirements for Eureka Mills CERCLA Action

Potential Action-Specific Requirements				
Action	**Criteria**	**Prerequisite**	**Citation**	**ARARs Determination**
Discharge to Surface Water	Filing of a notice of intent to be included in a general permit & preparation of a stormwater pollution prevention plan.	Construction activities that disturb 5 or more acres.	40 CFR 122.26(b)(14) [NPDES]	Relevant & appropriate. May be applicable to site grading & construction activity implemented as part of remedy for the site
Off-site Management of CERCLA Wastes	EPA Regional Office will determine acceptability of any facility selected for treatment, storage, or disposal of CERCLA waste.	Applies to any remedial or removal action involving off-site transfer of any hazardous substance or contaminant taken pursuant to any CERCLA cleanup.	CERCLA; 40 CFR § 300.440	Applicable to alternatives that involve landfill disposal of RCRA-characteristic waste.
Potential Location-Specific Requirements				
Condition	**Criteria**	**Prerequisite**	**Citation**	**ARARs Determination**
Within flood plain.	Requires federal agencies to evaluate the potential effects of actions they may take in a flood plain to avoid adverse effects associated with development.	Action that will occur in a flood plain such as lowlands and relatively flat areas adjoining inland waters and other flood prone areas	Executive Order 11988, Floodplain Management; 40 CFR 6, App. A; 40 CFR 6.302(b)	Applicable to residential areas.
Critical habitat upon which endangered species or threatened species depend.	Prohibits federal agencies from jeopardizing threatened or endangered species or adversely modifying habitats essential to their survival. Identify activities that may affect listed species. Actions must not threaten the continued existence of a listed species. Actions must not destroy critical habitat.	Determination of presence of endangered or threatened species. Applicable to facilities or programs authorized, funded or carried out by federal government	Endangered Species Act of 1973 (16 USC 1531 *et seq.*); 50 CFR 402; 40 CFR 302(h); 50 CFR 17	Applicable where listed species present (bald eagle is listed in Juab County).
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts.	Establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain as a result of a federal project or program.	Alteration of terrain that threatens significant scientific, prehistorical, historical or archeological data.	Archeological and Historic Preservation Act (16 USC 469 *et seq.*); 40 CFR 6.301(c)	Applicable.

Table 6-1
Regulatory Requirements for Eureka Mills CERCLA Action

Potential Location-Specific Requirements				
Condition	**Criteria**	**Prerequisite**	**Citation**	**ARARs Determination**
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts.	Regulates removal of archeological resources.	Applies only to work on public or tribal land	Archeological Resources Protection Act of 1974, 16 USC; 470aa-47011	Relevant and appropriate.
Within area where action may affect historic property.	Requires federal agencies to consider effect of any federally assisted project on any district, site, building, structure, or project that is included in or eligible for inclusion in the National Register of Historic Places.	Property included in or eligible for the National Register of Historic Places	National Historic Preservation Act, (16 USC 470 *et seq.*); 40 CFR 6.301(b); 36 CFR 800; 36 CFR 60	Applicable.
Within area where action may affect historic property.	Before expending state funds or approving undertaking, each state agency shall consider impacts on any district, site, building, structure, or specimen that is included in or eligible for inclusion in the National Register of Historic Places or the State Register; and allow the state historic preservation officer a reasonable opportunity to comment.	Property included in or eligible for the National Register of Historic Places.	UCA 9-8-404	Applicable.
Wetlands.	Prohibits discharge of dredged or fill material into wetlands without permit.	Discharge of dredged or fill material; wetlands as defined by USACE.	Clean Water Act Section 404; 40 CFR 230; 33 CFR 320-330	Applicable .
Wetlands.	Requires federal agencies conducting certain activities to avoid, to the extent possible, the adverse impacts associated with the destruction or loss of wetlands and to avoid support of new construction in wetlands.	Action involving construction of facilities or management of property in wetlands, as defined by 40 CFR 6, App. A, Section 4(j).	Executive Order 11990, Protection of Wetlands; 40 CFR 6, Appendix A; 40 CFR 6.302(a)	Applicable
Land-use compatibility, geologic concerns, surface water, wetlands, groundwater.	Provides solid waste facility location standards including restrictions on land use compatibility, geologic concerns, surface waters, wetlands, and groundwater.	Applies to disposal of solid waste in landfills, land treatment disposal sites, and piles.	Utah Solid and Hazardous Waste Act, UCA 19-6; UAC R315-302	Potentially relevant and appropriate for on-site repository.

Table 6-1
Regulatory Requirements for Eureka Mills CERCLA Action

Potential Location-Specific Requirements				
Condition	**Criteria**	**Prerequisite**	**Citation**	**ARARs Determination**
Modification to natural stream or water body.	Requires federal agencies involved in actions that will result in the control or structural modification of a natural stream or body of water to protect fish and wildlife resources. Must consult with the Fish and Wildlife Service and appropriate state agency.	Federal action resulting in diversion, channeling, or other activity that modifies a stream or river and affects fish or wildlife.	Fish and Wildlife Coordination Act (16 USC 661 *et seq.*); 40 CFR 6.302(g)	Applicable

7.0 DESCRIPTION OF ALTERNATIVES

It is EPA's intent to reduce the risk to human health to acceptable levels by meeting the RAOs specified in Section 6. 2 in the design and implementation of remedial actions. This section describes the remedial alternatives that underwent a detailed evaluation in the FS for residential areas and mine waste areas.

In the FS, technology types and process options were screened to eliminate those that are not technically feasible at the Site or that lack demonstrated effectiveness. Some of the remedial technologies/process options screened out include soil flushing, asphalt or concrete capping, and stabilization. Under CERCLA, a No-Action alternative must be considered at every site to establish a baseline for comparison with remedial alternatives. In addition to the No-Action alternative, four remedial alternatives were evaluated for the residential portion and four for the mine waste portion of the Site.

7.1 Residential Alternatives

A detailed evaluation was conducted of the following alternatives for the residential and commercial properties in Eureka. All of the residential alternatives evaluated except No Action contain the following elements:

- Cleanup of lead contaminated soils in yards
- Disposal of contaminated soils in a repository
- Public health actions until the remedial action is completed
- Institutional controls to ensure the long-term protectiveness of the remedy

During the initial screening of alternatives, neither Public Health Actions (Alternative 3) nor Institutional Controls (Alternative 2) met the screening criteria for effectiveness, and hence, they were dropped as "stand-alone" remedial alternatives. However, they are effective when combined with engineering controls and have been retained as components in each of the engineering alternatives.

All of the residential alternatives (with the exception of the No-Action alternative) require compliance with the same list of ARARs, i.e. fugitive dust, stormwater discharge and modifications to surface water drainages, requirements for closure of landfills (mine waste piles), handling of hazardous waste (if generated), requirements for dealing with flood plains, wetlands, and historical preservation issues. The only ARARs that do not apply to all the alternatives would be the requirements for disposal of contaminated soils at an off-site location for two of the alternatives.

Cleanup of lead-contaminated soils in yards, public health actions and institutional controls are common elements for all the residential alternatives except for No Action. The only element listed above that varies is the disposition of the contaminated soils. Therefore, the three common elements in each residential alternative (except for No Action) will be described prior to presenting the discussion on each of the residential alternatives (Alternatives 4A, 4B, 4C & 5).

Common Element No. 1: Cleanup of Lead-contaminated Soils in Yards -

Excavation of residential soil and subsequent placement in a repository is a routine approach for handling virtually any waste removed from the residential sites. The common components include:

- Characterizing the soil
- Excavating soils in contaminated areas
- Backfilling excavation with clean soil
- Replanting vegetation to limit erosion
- Replacing soils in vegetable gardens
- Paving of driving or walk way areas with asphalt or gravel

Contaminated soil would be excavated to a depth of 18 inches. The excavated soil would be transported to a repository in covered dump trucks in accordance with Department of Transportation (DOT) regulations. The area from which the soil is removed would be backfilled with clean base and topsoil and revegetated, primarily by hydroseeding. Restoration of the property would include replacing vegetation, gravel, fencing, and other features that existed prior to excavation. Vegetable garden soils would be replaced with sandy or clayey loam soils that have a specified minimum percentage of organic matter.

This alternative reduces future risk by removing the easily accessible contaminated material from a residential yard and placing it in a location designed to contain this type of waste. Future risks posed by contaminated soils below the clean fill would be managed by implementing institutional controls. Examples of these controls include zoning restrictions or placing restrictions on building permits that specify methods of handling and disposing of future excavated soils.

Common Element No. 2: Public Health Actions -

Public health actions are intended to increase local residents' awareness about ways to reduce their exposure to lead in the environment until remedial action is complete. These public health actions will be implemented under an Early Interim Action Record of Decision to provide early actions toward reducing exposure to lead prior to implementation of the final remedy. They will also be part of the final remedy selected in this ROD. The public health actions includes the following activities which will continue throughout the cleanup of the lead-contaminated soils.

- **Voluntary Blood Lead Testing Program for Children.** EPA, in cooperation with UDEQ and state and local public health authorities, will offer a voluntary blood lead testing program for children until blood lead levels decrease below 10 micrograms per deciliter (µg/dL) for a significant percentage of the children in Eureka. For children with blood lead levels greater than 10 µg/dL, public health officials will perform follow-up monitoring as well as frequent individual counseling for the families of these children.

- **Educational Outreach Programs.** EPA, in cooperation with UDEQ, will develop a focused educational outreach program for the Eureka community and its schools to educate parents,

teachers, and children about the hazards of lead in the environment and steps that can be taken to prevent exposure to lead contamination.

- **Voluntary Residential Program for Soil and In-home Dust Sampling and Cleanup.** EPA, in cooperation with UDEQ, will offer a voluntary comprehensive evaluation of individual home sites, including soil and in-home dust sampling, where a child has a blood lead level greater than 10 µg/dL to determine the most effective action to take. In specific cases, EPA, with the homeowner's permission, may clean the interior of residential homes where lead dust levels exceed a threshold level of 231 ppm and a child's blood lead level exceeds 10 µg/dL. EPA also will establish a program to loan special vacuums equipped with high-efficiency particulate air (HEPA) filters to Eureka residents so they can remove lead-contaminated dust from their homes.

Common Element No. 3: Institutional Controls -

Institutional controls are legally binding tools designed to ensure that future land uses are compatible with the long-term remedy and re-contamination of cleaned up properties does not occur. Institutional controls envisioned for the residential alternatives include zoning and building ordinances. Physical controls such as fencing and signage are not considered to be institutional controls.

For the residential areas (including commercial areas) in Eureka, EPA and the State have identified a combination of zoning and building ordinances to govern land disturbance activities. In addition, EPA and the State have identified these same tools (among others) for non-residential properties and for mine waste areas to govern the use of such lands. Institutional controls are not intended to hinder future development in either the residential or non-residential areas. Rather, they are designed to prevent improper excavation, handling, and disposal of contaminated soils or mine waste materials. To increase the effectiveness of institutional controls, Residential Alternatives 4Aand 4C provide for an open cell for disposal of contaminated wastes generated as a result of future development activities.

During the remedial design and remedial action phases, EPA and the State will work cooperatively with local governments to develop and implement institutional controls and to monitor their long-term effectiveness. This cooperative effort between the governments will also address the financial resources for implementation of these controls.

7.1.1 Residential Alternative 1 - No Action

No remedial action is proposed under this alternative. No action is a viable alternative in cases where contaminant concentrations are sufficiently close to cleanup goals and there is no threat of health impacts to people or harm to the environment. Potential receptor pathways and contaminant migration were evaluated as part of the RI. No action is only considered in cases where potential contaminant migration and future land use will not result in a potential exposure pathway. The No Action alternative provides a baseline for comparing other alternatives.

7.1.2 Residential Alternative 4 – Excavation/Disposal at Local Repository

All three alternatives described under Residential Alternative 4 include cleanup of lead-contaminated soils, public health actions and institutional controls. There is only one major difference between the three alternatives described in Residential Alternative 4 - where contaminated soils will be place during remedial action and during future development after the cleanup has been completed. Three alternatives were considered for Residential Alternative 4: (4A) disposal at Chief Mine No.1 waste pile; (4B) disposal at an nearby secondary site; and (4C) combination disposal using both Chief Mine No. 1 waste pile and a secondary location(s) within Eureka.

7.1.2.1 Alternative 4A - Excavation/Disposal at Chief Mine No. 1

For Alternative 4A, a portion (southwest side) of the Chief Mine No. 1 waste pile would be used as the on-site repository. The rest of the Chief Mine No. 1 waste pile will be capped with an engineered barrier. The Chief Mine No. 1 Waste pile was identified based upon the following criteria:

- **Location.** The Chief Mine No. 1 waste pile is centrally located with respect to the residential home sites and other mine waste areas from which contaminated soil may be removed. The central location reduces transportation costs and risks associated with traffic and public safety.

- **Accessibility.** The repository site is readily accessible by several existing roadways.

- **Volume (capacity).** The footprint of the overall property area is large enough to handle the estimated volume of the materials that will be removed during remediation of residential sites. While there is enough capacity within the property boundary to allow for final grading and provide capacity for maintaining an open cell for long-term soil disposal, the footprint of the current waste pile would be expanded. The size and height of the final waste pile and the length of the slopes would present a concern for the long-term stability of the repository.

- **Stability.** The Chief Mine No. 1 waste pile is located on a relatively flat, broad area with a stable slope, minimizing the risk of a slope failure. It is unlikely that erosion caused by surface drainage would impact the stability of the repository. The design of the repository and remediation of the mine waste piles would include appropriate surface runon and runoff measures. The stability of the site is demonstrated by the fact that the waste pile has been in place for some length of time with no adverse effects caused by erosion, however, a significant increase in the height and size of the pile could potentially change this.

- **Waste Consolidation.** The Chief Mine No. 1 waste pile already contains approximately 500,000 cubic yards of contaminated material, which represents approximately 20% of

the volume of contaminated materials estimated to be present in OUs 00-3. The Chief Mine No. 1 waste pile represents the largest single percentage of waste material among all waste piles making it a logical place to consolidate contaminated materials. Moving this material to another repository location would increase potential exposure during excavation and transport and would significantly increase cleanup costs.

One cell of the repository would remain open following the cleanup by EPA for future soil disposal only. An open cell is considered necessary to successfully implement institutional controls by providing a means for local residents to dispose of lead-contaminated soils in the future. Disposal in the open cell would be limited to contaminated soils excavated during future construction authorized under a building permit issued by local government. The open cell would need to be operated in a cost effective manner to enhance residents' compliance with the disposal requirements of any adopted ordinance.

7.1.2.2. Residential Alternative 4B – Excavation/Disposal at Secondary Site Near Eureka

Under Alternative 4B, Chief Mine No. 1 waste pile would remain in place and be capped with an engineered barrier. A nearby location would be selected as a repository for residential soils. Site selection criteria for this alternative include:

- **Location.** The repository site would be located within a 6-mile radius of Eureka. Because the repository site would be located outside of Eureka, dust from the repository should not impact the residential areas of Eureka. The repository site would be located away from ecologically sensitive areas (i.e., not in a wetlands).

- **Accessibility/Stability.** The repository site would be readily accessible by existing roadways and in an area that would be erosionally stable.

- **Volume (capacity).** The area selected for the repository site would be large enough to handle the estimated volume of contaminated materials that will be removed during remediation of residential sites.

Site selection, construction, and closure of this repository would be designed to meet all ARARs, including State of Utah location and closure standards for a solid waste facility. The facility would be engineered to meet ARARs related to landfill performance and design. Because of the off-site location of the repository, there would be additional requirements in the construction of the repository and for the transport of the mine waste to comply with applicable State permit regulations and EPA's off-site rule for disposal of contaminated wastes from a CERCLA site. In general, off-site disposal of waste without treatment contradicts the Agency's preference for treatment or for on-site disposal. The repository at the off-site location would be fully closed, with no cells remaining open for future soil disposal.

7.1.2.3 Residential Alternative 4C – Excavation/Combination Disposal at Chief Mine No. 1 and Secondary Site Within Eureka

Under Alternative 4C, the Chief Mine No. 1 waste pile and one or more mine waste locations within Eureka would be used for disposal of contaminated soil. There are several locations that have the potential to be used as secondary on-site repositories. These locations would be evaluated in detail during the remedial design phase of the project. The locations include mine waste areas that would require remediation in any case, and could afford an optimal location for future disposal of contaminated soils. The amount of waste allocated to each site would be determined during remedial design. Waste placement would be based on considerations such as minimizing the ultimate profile of the Chief Mine No. 1 waste pile; slope stability and the footprint requirements of each mine waste area; and preservation of historic features in the design of the repository site(s).

One cell of the Chief Mine No. 1 repository or at one of the other on-site repository locations in Eureka would remain open and managed for acceptance of contaminated soils generated from future development.

7.1.3 Residential Alternative 5 – Excavation/Disposal in Commercial Off-Site Repository

Similar to the three alternatives described under Residential Alternative 4, this alternative will include cleanup of lead-contaminated soil, public health actions and institutional controls. This alternative differs by using a commercial off-site repository that is authorized to accept the waste materials removed from the Site. Commercial repositories are privately managed and licensed to accept waste material. The nearest commercial repository is approximately 50 miles from Eureka.

To take waste off-site could require pretreatment prior to disposal if the waste fails to meet RCRA land disposal restrictions. However, it is assumed that most of the waste materials removed from the residential areas could be placed directly in a commercial repository based on the results of TCLP analysis obtained during the Removal Site Assessment. This alternative would require that excavated soil be characterized sufficiently to ensure that the soil meets the repository's waste acceptance criteria.

Off-site disposal would eliminate costs associated with maintenance and closure of an on-site repository and eliminate potential exposures to local residents. However, the costs associated with transporting waste material to an off-site repository would make this option less cost effective for large quantities of waste. In addition, transportation over public highways or railways could pose an increased short-term risk to the public due to traffic accidents .

Another factor to consider with this alternative is that while the residential soils would be taken off-site, mine waste would still remain on-site unless the mine waste piles were also removed. (In fact that alternative for mine waste was eliminated during the screening of alternatives in the FS based on its high cost). The cleanup for residential yards calls for removing only the top 18 inches of

contaminated soil, also leaving some soil contamination in place. There is no provision in this alternative for an open-cell on-site for future disposal of contaminated soils.

7.2 Mine Waste Alternatives

The mine waste piles and non-residential areas identified for evaluation during the Feasibility Study include the May Day Mine, Godiva Tunnel and Godiva Mine, Chief Mine No. 2; Chief Mill No. 1, Chief No.1 Mill Tailings, Chief Mill Site No. 1, Chief Mine No. 1, Eagle and Blue Bell Mine, Eagle and Blue Bell Transition Zone and Dump, Snowflake Mine Dump, Gemini Mine, Bullion Beck Mine and Bullion Beck Mill, Eureka Hill Waste Rock and the Eureka Hill Drainage. Non-residential areas include DM-6, DM-10, DM-22 and DM-25.

Mine Waste Sites:

There are two major factors to consider for remediation of the mine waste piles in Eureka: 1) whether some or all of the material in a mine waste pile will be removed and hauled to a repository or will the mine waste pile be capped in-place; and 2) the type of cap that will be used to cover the mine waste piles and the repository.

In deciding whether mine waste piles will be removed or remain in-place, there are a number of criteria that will be considered during remedial design. They include but are not limited to the following:

- Slope stability
- Volume of material
- Ultimate size & scale of the repository(s)
- Impact to the community due to haul truck traffic, dust generation, etc.
- Preservation of historic features such as mining head frames
- Remediation costs

Cover for a mine waste pile or the repository would be either a rockface or vegetation cover, depending on design requirements. In the following discussion on the mine waste alternatives, the term "engineered cover or cap" is used to refer to a cover that provides an erosionally stable barrier (rock or vegetation) that prevents direct contact with the contaminated materials and fugitive dust. The cover would be designed to reduce direct contact and fugitive dust emissions; but not to impede infiltration, since the mine waste materials are not acid-forming.

Designing a cover for the mine waste piles and repository involves a number of considerations including the criteria listed above as well the following additional factors:

- Reduction of the potential for direct contact with mine waste;
- Minimization of operation and maintenance costs;
- Retention of the historical appearance of this historical mining community to the extent feasible.

The following discussion and accompanying cost estimates for each alternative assume the use of rockface for final cover. However, the final cover for each of the mine waste piles will be decided during remedial design. There are several advantages to rock cover over vegetative cover. The use of rockface for the cell cover would help stabilize slopes, and would allow steeper slopes than could be achieved with the use of vegetation. To some extent, steeper slopes would minimize the overall footprint of the repository and in some cases would also allow for the retention of historic features (such as mining head frames). Establishing a rock face cover would allow some mine waste piles to be capped in-place. This would not be feasible with a vegetative cover because of steeper slopes.

Due to the arid and windy climate in Eureka, successful establishment of vegetation on the mine waste piles is also problematic. It would require a significant amount of watering over several growing seasons to ensure successful revegetation. Rockface would also assist in reducing potential access to mine waste by discouraging certain recreational activities, such as motorize recreational vehicles, that are incompatible with maintaining a stable protective cover.

All of the mine waste alternatives (with the exception of the No-Action alternative) require compliance with the same list of ARARs, i.e. fugitive dust, stormwater discharge and modifications to surface water drainages, requirements for closure of landfills (mine waste piles), handling of hazardous waste (if generated), requirements for dealing with flood plains, wetlands, and historical preservation issues. The only ARARs that do not apply to all the alternatives would be the requirements for disposal of mine waste at an off-site location for one of the alternatives.

Non-Residential Areas:

EPA will take response actions to address lead contamination in non-residential areas, which are generally located to the southeast quadrant of the Site. EPA plans to implement the following response activities: (1) excavate and dispose of lead-contaminated soils up to a depth of 18"; or (2) leave lead-contaminated soils in place with appropriate land use controls until a deferred cleanup can be undertaken by individual property owners at the time of development.

In assessing whether to perform an immediate as opposed to a deferred cleanup, EPA will work closely with the local community, the State, and individual private property owners. If remediation is deferred, EPA would work with the City of Eureka and the County of Juab to establish, implement, and enforce institutional controls such as zoning and building ordinances. These ordinances would place controls on the land and require property owners to address the residual contamination as a part of future building activities. For large properties where contaminated soils are remediated, controls would be required to ensure successful revegetation possibly including the fencing of affected properties and adequate watering by the property owner to promote and maintain vegetative cover.

In addition, EPA plans to work with individual property owners to minimize the usage of multiple travel corridors across private properties with residual lead contamination. Specifically, EPA will consider the potential for building a travel corridor through such properties which would limit off-road vehicle users' contact with soils and dust. This may include the construction of a bikeway or other path, capped with an appropriate road cover to minimize exposure to contaminated soils.

Institutional Controls:

Institutional controls are envisioned for the mine waste and the non-residential areas to ensure the long-term protectiveness of the engineered remedy. For the mine waste areas, institutional controls may include proprietary controls (e.g.; property easements, deed restrictions and deed notices) or governmental controls (e.g.; local zoning and building ordinances). Institutional controls on the mine waste areas are not intended to prevent future development of these areas but to ensure the long term protection of human health in Eureka by containment of contaminated materials. For non-residential areas that may be suitable for residential or commercial development, institutional controls such as zoning or building ordinances would be implemented to prevent the improper excavation, handling and disposal of contaminated soils.

7.2.1 Mine Waste Alternative 1 - No Action

No remedial action is proposed under this alternative. No Action is a viable alternative only in cases where contaminant concentrations are sufficiently close to cleanup goals and there is no threat of health impacts to people or harm to the environment. No Action should be considered only in cases where potential contaminant migration and future land use will not result in a potential exposure pathway. The No Action alternative provides a baseline for comparison of other alternatives.

7.2.2 Mine Waste Alternative 3A – Excavation/Disposal at Chief Mine No.1

Mine Waste Alternative 3A, involving excavation of mine waste piles with subsequent disposal in a repository would include the following components:

- All above-grade mine waste would be removed and placed in the Chief Mine No. 1waste pile.
- The footprint where the mine waste pile resided would be regraded to stable slopes for surface drainage and runoff controls.
- Underlying soils would be excavated based on a cleanup level of 735 ppm for lead.
- Institutional controls such as deed restrictions and zoning/building ordinances would be implemented to ensure that future use of the mine waste piles and repository would not impact the effectiveness of the remedy.

Soil excavation would encompass all above-grade waste and 12 to 18 inches of subsurface soil beneath each waste pile. The volume of material to be excavated if the entire mine waste pile were to be removed is highly uncertain. This uncertainty could significantly change the costs as well as the volume calculations for the repository. During design, additional information would be required to refine these volume estimates. Confirmation samples would be collected and analyzed to verify that lead concentrations in the remaining soils are below the PRG of 735 ppm. The excavated material would be transported in covered dump trucks to a repository in accordance with DOT

regulations. The areas from which the mine wastes and underlying soil are removed would be regraded and/or backfilled Non-residential areas would be addressed as described in Section 7.2. If a non-residential area is remediated, the property would be backfilled with clean soil, since it may be used for future development. The property would be then regraded for drainage and revegetated to prevent erosion. Under this alternative, all mine waste piles listed above would be moved to the Chief Mine No. 1 waste pile. The discussion regarding the criteria for selecting this location is presented in Section 7.1.2, Residential Alternative 4A – Excavation/Disposal at Chief Mine No. 1. Implementation of institutional controls for both the remediated areas and the repository is an integral component of this alternative.

The entire Chief Mine No. 1 repository surface would be capped with the exception of one cell, which would remain open for future soil disposal. Slopes would be contoured and riprapped to minimize erosion. The cost of this alternative includes an engineered cap on the Chief Mine No. 1 repository. Capping was selected as a likely candidate for closure of the repository because it requires minimal additional equipment and mobilization and is a more effective technology for closure than solidification or chemical stabilization. An engineered cap is flexible and can sustain some ground movement and settlement. While design specifications would be determined during remedial design of the project, cost estimates for this alternative assume a 6-inch subbase, a geotextile fabric and 6-inch cover. The cover material is assumed to be rock.

While some mining head frames may be able to be retained during the excavation of the waste piles, the Feasibility Study assumed that for Alternatives 3A, 3B & 3C, these features would be eliminated.

7.2.3 Mine Waste Alternative 3B – Excavation/Disposal at Secondary Site Near Eureka

Under Alternative 3B, all mine wastes (with the exception of Chief Mine No. 1) would be excavated and deposited at an engineered repository located within a six mile radius of Eureka. Material from Chief Mine No. 1 waste pile would not be moved because of the costs associated with transporting such a large volume of material. Site selection criteria for a secondary location is discussed in Section 7.1.3 , Residential Alternative 4B. The Chief Mine No. 1 waste pile would be capped in place to eliminate the need to excavate, transport, and dispose of the large quantity of mine waste currently at this area. Once all material is placed, the secondary repository would be fully capped with an engineered cover. While design specifications would be determined during the remedial design phase of the project, cost estimates for this alternative assumed a 6-inch subbase, geotextile fabric, and 6-inch cover. No cell would be left open to accommodate future waste. Implementation of institutional controls for both the mine waste areas and the repository is an integral component of this alternative. Non-residential areas will be addressed as described in Section 7.2.

7.2.4 Mine Waste Alternative 5A – Partial Excavation/Capping with Disposal at Chief Mine No. 1

Mine Waste Alternative 5 provides the option of leaving some waste piles capped in place with limited waste removal to allow recontouring of the piles for stability. The goal of remediating the

mine waste piles is to move as little material as possible from one location to another. For large waste piles, limited excavation may be necessary to allow adequate recontouring of the piles, which would then be capped with an engineered cover. If feasible, mine waste piles would be capped in-place without removing any material. With smaller waste piles, it may be more effective to conduct a complete removal and consolidate them with a larger waste pile. Relocation of mine waste material would be decided during remedial design. Under this alternative, historic features such as head frames could be preserved.

Two options are presented in Alternative 5. These options are: (1) partial excavation and capping with disposal at Chief Mine No. 1 and (2) partial excavation and capping with disposal at Chief Mine No. 1 waste pile and a secondary location within Eureka. The volume of material to be removed would be determined as part of the remedial design. The goal of the design would be to remove as little waste material as possible while still achieving stable slopes. Both alternatives would include the following factors: maintaining stable slopes, minimizing the ultimate profile of the repository, limiting disruption to the community with haul truck traffic and dust generation and preserving of historic features such as mining head frames.

Under this alternative (5A), most waste piles would be regraded to a stable configuration and capped in-place, while some mine waste piles may require some excavation and removal to achieve stable slopes. Any excavated wastes would be disposed of at Chief Mine No. 1 waste pile. The remainder of the partially excavated waste pile would be regraded and capped in place. For small mine waste piles, it may be more efficient to consolidate them with a larger waste pile. To the maximum extent possible, mine waste piles would be stabilized in place to minimize fugitive dust problems, reduce haul truck traffic through town and to limits costs.

Non-residential areas will be addressed as described in Section 7.2. The areas from which the mine wastes and underlying soil have been removed would be regraded and/or backfilled If a non-residential area is remediated, the property would be backfilled with clean soil, since it may be used for future development. The property then would be regraded for drainage and revegetated to prevent erosion For cost estimating purposes, a depth of 18 inches has been assumed. Institutional controls such as deed restrictions, or zoning, and building ordinances would be implemented to ensure the effectiveness of the cover on the mine waste piles. This alternative would be designed with capacity at Chief Mine No. 1 waste pile for an open cell for future soil disposal.

7.2.5 Mine Waste Alternative 5B – Partial Excavation/Capping with Disposal at Chief Mine No.1 and Secondary Site Within Eureka

The primary difference between Alternative 5A and Alternative 5B is the waste placement location. Under Alternative 5B, waste material may be placed at Chief Mine No. 1 waste pile or at a secondary location within Eureka. There are several locations in Eureka with extensive mine waste contamination that could potentially be used as secondary on-site repositories. These areas would be cleaned up regardless of the siting of a secondary repository. During the remedial design, these locations would be evaluated in detail to determine the optimal location and volume for a secondary repository. To the maximum extent possible, mine waste piles would be stabilized in place to

minimize fugitive dust problems, reduce haul truck traffic through town; and limit costs. Waste placement would be based on a number of factors discussed above as well as including the goal of minimizing the total aggregate volume (profile) of the Chief Mine No. 1 waste pile and meeting historic preservation requirements.

One cell at the Chief Mine No. 1 repository or at a secondary location in Eureka would remain open and managed for acceptance of contaminated soils generated from future development. The cell would be operated in the manner described under Residential Alternative 4A.

8.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

Each remedial alternative has been evaluated against nine criteria defined in the National Contingency Plan (NCP) (NCP §300.430(f)(5)(i)). This section summarizes a comparative analysis of the residential and the mine waste alternatives presented in the detailed analysis section of the Site RI/FS Reports (WGI, 2002a and b). Each alternative is discussed in terms of the nine NCP criteria:

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility or volume through treatment
- Short-term effectiveness
- Implementability
- Cost
- State acceptance
- Community acceptance

The No Action alternative is included for baseline comparison.

8.1 Comparative Analysis of Residential Alternatives

Table 8-1 presents the comparative analysis of residential alternatives. A discussion comparing the residential alternatives against each of the nine criteria is provided in the subsections below

8.1.1 Overall Protection of Human Health and the Environment

Each residential alternative was evaluated against the primary criteria of overall protection of human health and the environment by describing how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

With the exception of Residential Alternative 1 – No Action, Residential Alternatives 4A, 4B, 4C, and 5 are protective of human health and the environment. All of the alternatives except No Action protect human health by eliminating the exposure pathway through excavation of lead contaminated soils and backfilling with clean soils at residential properties. Although activities are expected to generate soil dust, this can be minimized through the use of engineering controls. The residential alternatives are intended to eliminate the potential for direct contact with contaminated soils and the generation of lead contaminated dust in the residential areas.

Public health actions implemented during remedial action will increase the public's awareness of lead exposure and inform the community about ways to reduce exposure to lead contaminated soils and dust until remediation is complete. Institutional controls will be implemented to ensure that future disturbance of soils is conducted in a controlled manner and contaminated soils are disposed of properly.

The main differences among the alternatives are 1) the location of the repository for waste materials during remedial action; and 2) the creation of an open cell for disposal of contaminated soils in the future. Alternatives 4A and 4C provide on-site disposal during remediation and an open cell in Eureka for disposal of contaminated soils in the future. Alternatives 4B and 5 have off-site disposal during remediation and do not offer an open cell for future local disposal. The lack of a future local disposal option would diminish the effectiveness of the institutional controls if there were not a convenient place for residents to dispose of contaminated soils.

8.1.2 Compliance with ARARs

Section 121(d) of CERCLA and the NCP require that remedial actions at CERCLA meet legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are referred to as ARARs.

Each alternative has been evaluated for compliance with the contaminant-specific, location-specific, and action-specific ARARs described in Table 8-1. With the exception of the No Action alternative, all the Residential Alternatives are expected to comply with all ARARs. However, Alternative 4B would need to comply with the additional off-site disposal requirements. Under RCRA Subtitle C, off-site disposal would require construction of a liner and an impermeable cap as well as meeting strict financial assurance provisions and conducting long-term groundwater monitoring. Compliance with these requirements for off-site disposal would require additional time and effort during remedial design and would substantially increase the construction costs. Disposal of contaminated soils at a commercial facility (Alternative 5) could require additional testing for leachability and in the event that such test fail established criteria, could require treatment prior to disposal.

8.1.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

Because the No Action alternative does not address the source of contamination, exposure to contaminated soils would continue and the risk would not be reduced. Residential Alternatives 4A, 4B, 4C and 5 will provide long term protection to some degree. All of the alternatives provide the same standard of cleanup during remedial action including an 18 inch soil cover, which will provide an extra measure of protection and long term effectiveness should institutional controls be inadequate in ensuring the integrity of the clean soil cover.

Alternatives 4A and 4C provide an open cell in Eureka for future disposal of contaminated soils. Under institutional controls, excavation and disposal of contaminated soils would be controlled to ensure proper handling and disposal. Alternative 4A envisions all contaminated soil being disposed of at the Chief Mine No. 1 repository both during remedial action as well as in the future under institutional controls. Alternative 4C envisions contaminated material being disposed of at the Chief

Mine No. 1 repository as well as at another mine waste area in town. The location of an open cell for future disposal under Alternative 4C may be at either one of the repositories depending upon a number of design and logistical considerations.

Alternatives 4B and 5 do not have provisions for an open cell in Eureka, thus the burden of proper disposal, (likely at some distance from Eureka), would be on the property owner. The lack of a convenient, appropriate local disposal site thus diminishes the effectiveness of the institutional controls, and alternatives 4B and 5 would be somewhat less effective in the long term.

Reviews at least every five years, as required, would be necessary to evaluate the effectiveness of any of these alternatives because hazardous substances would remain onsite in concentrations above health-based levels.

8.1.4 Reduction of Toxicity, Mobility, or Volume through Treatment

None of the Residential Alternatives provide treatment as a component of the remedy. With the exception of the No Action alternative , protection is achieved through excavation and disposal of contaminated soils in a repository.

8.1.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedial action and any adverse impacts that may be posed to workers, the community, and the environment during implementation.

There are no short-term impacts associated with the No Action alternative, because no actions are proposed. The other Residential Alternatives are expected to have similar short-term impacts. While potential dust generation is expected under these alternatives, effective dust control measures such as watering, modifying remedial activities during windy periods, use of covered dump trucks, and keeping streets clean during remedial activities will provide protection to both workers and the community. Effectively monitoring air emissions around town and especially near areas of intensive construction activity will determine the effectiveness of dust suppression measures and where improvements may be needed.

Short-term impacts on the community in terms of increased localized truck traffic during waste hauling activities are also expected; however, these impacts can be reduced by implementing traffic control plans, properly sequencing the work; and paying strict attention to safety procedures. Residential Alternative 5 poses the greatest potential for impact on the public at large because of the need to transport wastes over a long distance, although the traffic route for the most part will likely be along remote stretches of highway.

To reduce the short-term impacts during remedial action and to increase residents' awareness of lead exposure, public health actions would be implemented as a component of all four Residential Alternatives. While the focus of the public health actions is to raise the public's awareness of how

to limit their exposure to lead until the remedial action is completed, education could provide another means of addressing residents' concerns with short term impacts.

The length of time required to implement the residential cleanup would be similar for all alternatives, although there could be a delay in initiating remedial action under alternative 4B due to the need to meet regulatory requirements for construction of an off-site disposal site. Remedial action in the residential areas could take two to three years to complete, but could extend to four or more years if funding is delayed.

8.1.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered. There are no actions to implement under the No Action alternative. Residential Alternatives 4A, 4B, 4C and 5 incorporate soil excavation, which is a common remedial activity for residential areas. Although the required construction services are not unique, a limited labor pool in Eureka means that a number of workers must travel some distance from the Salt Lake Valley or beyond. The availability of backfill material, the need for soil amendments, and the availability of suitable sources of rock cover will require careful evaluation during the remedial design to minimize the costs of hauling these materials long distances. The regulatory requirements for off-site disposal under 40 CFR 300.440 may also make the off-site disposal alternatives (4B and5) more difficult to implement.

All the Residential Alternatives have institutional controls as a component of the remedy. Implementation of the institutional controls will require close coordination with state and local governmental officials to ensure success. Given the limited financial resources of local government to implement and administer institutional controls, the development of local ordinances will require thoughtful and careful consideration. Alternatives 4A and 4C are more desirable from the standpoint of implementability for institutional controls because they provide an open cell for future disposal of contaminated soils.

8.1.7 Cost

There are no costs associated with the No Action alternative. Residential Alternative 5 has the highest conceptual capital cost at $44,700,000 primarily due to the transportation and disposal costs associated with the use of an off-site disposal facility. The estimated capital costs for Alternative 4B ($ 34,700,000) are somewhat higher than for 4A and 4C due to the requirements for constructing an off-site disposal facility and a slightly longer haul distance. Estimated capital costs for implementing Residential Alternative 4A are $32,500,000, while the capital costs for Alternative 4C are estimated at $33,400,000. The higher cost of Alternative 4C compared to Alternative 4A is associated with development of a secondary on-site repository. Major uncertainties in the estimated costs include the variability in the sizes of residential properties making it difficult to estimate an average lot size, and the costs associated with obtaining clean backfill and topsoil. The cost summaries for the residential alternatives are presented in Table 8-2.

Operation and maintenance (O/M) costs associated with the Residential Alternatives include administration of institutional controls and operation of the open cell for future disposal of contaminated soils. The O/M costs were calculated for a 30 year period. Because Alternatives 4B and 5 do not provide an open cell, the O/M costs for these two alternatives are less than for alternatives 4A and 4C. The O/M costs for alternatives 4A and 4C are $1,072,000, while the O/M costs for alternatives 4B and 5 are $608,000 and $407,000, respectively.

8.1.8 State Agency Acceptance

The State of Utah supports cleanup of the Site to ensure protection of human health and the environment and implementation of the Selected Remedy in a cost effective and efficient manner. The State's ability to provide the 10% cost share and to perform operation and maintenance is contingent on appropriations and expenditure authority from the Utah State Legislature.

8.1.9 Community Acceptance

During the public comment period, the public expressed support for the residential cleanup. The public did not seem to have a preference for which Residential Alternative was selected. However, concern was expressed regarding the impacts from disposal of contaminated soils at the Chief Mine No. 1 waste pile on the adjacent residential areas.

8.2 Comparative Analysis of Mine Waste Alternatives

Table 8-3 presents the comparative analysis of Mine Waste Alternatives. A discussion comparing the alternatives against each of the nine criteria is provided in the subsections below.

8.2.1 Overall Protection of Human Health and the Environment

With the exception of the No Action alternative, Mine Waste Alternatives 3A, 3B, 5A and 5B are protective of human health and the environment.

Mine Waste Alternatives 3A and 3B are similar in that they call for consolidating the mine waste piles in one or two locations. They differ only in where the mine waste will be consolidated. Mine Waste Alternative 3A consolidates all mine waste piles at the Chief Mine No. 1 waste pile, whereas Mine Waste Alternative 3B proposes to consolidate all mine waste piles except the Chief Mine No. 1 at a secondary location within a six mile radius of Eureka.

In Mine Waste Alternatives 3A and 3B, a large volume of material must be moved and the generation of dust will be a significant issue. However, this can be minimized by the use of engineering controls. While consolidation of all mine waste at the Chief Mine No. 1 waste pile may be technically feasible, there is some concern that this option may not provide the best overall protection of human health and the environment due to the volume of material that would be placed in a single location. In the event of a failure of the repository cap, there could be significant risk to the adjacent residential areas.

Mine Waste Alternatives 5A and 5B are similar in that the goal of both is to minimize as much as possible the amount of mine waste material that is moved from one location to another. They differ only in where the mine waste material would be placed in order to achieve stable slopes prior to capping. Currently, EPA believes that most mine waste piles could be capped in-place. Soil dust would be generated during remedial activities, but could be minimized through the use of engineering controls. Since very little mine waste material must be moved, the generation of dust would be significantly less than with Alternatives 3A or 3B. The smaller waste piles would be more manageable to construct and maintain, although there would still be some risk of potential exposure if a cap fails.

8.2.2 Compliance with ARARs

Section 121(d) of CERCLA and the NCP require that remedial actions at CERCLA attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are referred to as ARARs.

Each alternative has been evaluated for compliance with the contaminant-specific, location-specific, and action-specific ARARs described in Table 6-2. With the exception of the No Action alternative, all the mine waste alternatives are expected to comply with all contaminant-specific, action-specific, and location-specific ARARs. Mine Waste Alternative 3B would require additional time and effort during remedial planning prior to construction and would entail additional costs for construction of a Subtitle C disposal facility under RCRA. Preservation of historic features associated with the mine waste piles would more likely be feasible with Alternatives 5A or 5B. With Alternatives 3A and 3B, most historic features would be lost.

8.2.3 Long-Term Effectiveness and Permanence

Because Mine Waste Alternative 1 - No Action - does not address the source of contamination, exposure to the contaminated materials would continue. Mine Waste Alternatives 3A and 3B would provide a degree of long-term effectiveness and permanence because they remove the source of contamination and consolidate it in controlled repositories. Long-term maintenance of the repositories would be required under both alternatives. If all the mine waste piles were consolidated at the Chief Mine No. 1 repository in addition to the residential soils, the size of the pile could increase the risk of exposure should the cap fail. Under Alternative 3B, the more remote repository location would increase the frequency of site inspections to ensure that cap was not disturbed by human activity.

Mine Waste Alternatives 5A and 5B would provide similar levels of protection to 3A or 3B by removing the source of contamination and consolidating it in controlled repositories. While both 5A and 5B would require long-term inspection and maintenance of multiple areas, the smaller size of the mine waste piles would make maintenance more manageable. With alternative 5B, a secondary repository would allow the flexibility to limit the size of the repository at the Chief Mine No. 1. Although the design of the cover for the mine waste pile(s) will be decided during remedial design, it is anticipated that a rock cover rather than a vegetative cover will be selected, as long-term maintenance of a rock cover would be significantly less and the cover would be more stable.

Institutional controls in the form of either deed restrictions or local zoning and building ordinances would be required to limit use of the mine waste piles to those that would be compatible with the remedy.

Reviews at least every five years, as required, would be necessary to evaluate the effectiveness of any of these alternatives because hazardous substances would remain onsite in concentrations above health-based levels.

8.2.4 Reduction of Toxicity, Mobility, or Volume through Treatment

None of the Mine Waste Alternatives provide treatment as a component of the remedy. With the exception of the No Action alternative, protection is achieved through excavation and disposal of contaminated soils in a repository, backfilling with clean soils and re-vegetation.

8.2.5 Short-Term Effectiveness

No remedial actions are implemented under Mine Waste Alternative 1 - No Action - so there are no impacts on workers, the community, or the environment. Mine Waste Alternatives 3A, 3B, 5A and 5B all have varying degrees of short-term impacts that must be considered. Dust generation is expected during implementation of all the Mine Waste Alternatives, but the amount of dust associated with moving all of the mine waste piles under Alternatives 3A or 3B would be significantly greater than with either Alternative 5A or 5B. Dust suppression measures, traffic control plans and safety procedures can be designed to mitigate fugitive dust generated during remedial action, providing protection to both workers and the community.

A significant increase in localized truck traffic during waste hauling activities is a major concern with Alternatives 3A and 3B. Mine Waste Alternatives 5A and 5B present less impact from haul traffic because the goal of these alternatives is to move as little material as possible from one location to another. Alternatives 5A and 5B could be implemented in two to three years depending on funding availability. It is anticipated that alternatives 3A and 3B would take an additional year due to the amount of material to be moved. Alternative 3B could also take longer due to the need to meet regulatory requirements for construction of an off-site disposal repository.

8.2.6 Implementability

The Mine Waste Alternative 1 - No Action - requires no implementation. Both Mine Waste Alternatives 3A and 3B involve moving mine waste material. Mine Waste Alternative 3A is technically feasible, however, the movement of all materials to the Chief Mine No. 1 would increase the size of the pile three-fold and significantly impact the neighboring residential areas with haul truck traffic.

Mine Waste Alternatives 5A and 5B are more easily implemented because they primarily involve regrading mine waste material on location into a stable formation, rather than moving it to a new location. While some mine waste material may be moved to another location on-site, a major goal with Mine Waste Alternatives 5A and 5B is to limit the amount of material that is moved, thus minimizing haul traffic and dust generation. Implementation of Mine Waste Alternatives 5A or 5B is projected to take one to two years less time than the implementation of Alternatives 3A or 3B.

This factor makes Mine Waste Alternatives 5A and 5B more implementable than either Alternatives 3A or 3B.

The implementability of Alternative 5B may be more feasible than 5A because it provides the flexibility of more than one repository location. By having another repository for mine waste or residential soils, the scale and footprint of the Chief Mine No. 1 waste pile can be minimized, and the impacts (haul truck traffic, dust, etc.) to the residents living adjacent to the Chief Mine No. 1 can be reduced.

Although the required construction services are not unique, a limited labor pool in Eureka means that a number of workers must travel some distance from the Salt Lake Valley or beyond. The availability of backfill material, soil amendments and the availability of suitable sources of rock cover will require careful evaluation during remedial design to minimize the costs of hauling these materials long distances.

8.2.7 Cost

Mine Waste Alternative 3B is estimated to have a higher capital cost ($39,600,000) than Alternative 3A ($27,000,000), primarily because of the costs associated with developing the secondary site for a repository. Capital costs for Alternative 5B ($27,500,000) are estimated to be higher than costs for Alternative 5A ($25,900,000), again due to costs associated with development of the secondary site. A mitigating factor may be that the secondary repository site would be located on a mine waste area which would require remediation in any case.

The major uncertainty in the cost estimates for Mine Waste Alternatives 3A and 3B lies in the estimated volume of material to be moved. The conceptual volume estimate that was used to evaluate the remedial alternatives could increase significantly during design or remedial action, causing an equally significant increase in cost. The costs for cap material (soil and rock) are also subject to some uncertainty depending on the final size of the repository. However, the uncertainty of costs for cap material would not impact the overall costs as significantly as the volume of waste material. The cost summaries for the Mine Waste Alternatives are presented in Table 8-4.

O&M costs associated with the Mine Waste Alternatives range from $380,000 for Alternatives 5A and 5B to $434,000 and $436,000 for Alternatives 3B and 3A respectively. O&M of the rock cover is expected to be minimal once a stable slope is established.

8.2.8 State Acceptance

The State of Utah supports cleanup of the Site to ensure protection of human health and the environment and implementation of the Selected Remedy in a cost effective and efficient manner. The State's ability to provide the 10% cost share and to perform operation and maintenance is contingent on appropriations and expenditure authority from the Utah State Legislature.

8.2.9 Community Acceptance

The public did not make any specific comments concerning which of the Mine Waste Alternatives was preferred. Comments were received indicating a preference for preserving the historic features (i.e.; head frames) associated with the mine waste piles. Otherwise, most comments indicated general support for the proposed remedy.

Table 8-1

Detailed Analysis of Alternatives for Remediating Soil in Residential Sites

	Alternative 1 No Action	Alternative 4A Excavation/Disposal at Chief Mine No. 1	Alternative 4B Excavation/Disposal at Secondary Site near Eureka	Alternative 4C Excavation/Combination Disposal at Chief Mine No. 1 and Secondary Site Within Eureka	Alternative 5 Excavation/Disposal in Commercial Off-Site Repository
OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT					
Direct contact/soil ingestion and inhalation	This alternative does not prevent inhalation or ingestion of contaminated soil.	Excavation and on-site disposal protects human health by reducing contamination from the residential properties. Some potential exists for contamination exposure from existing mine waste piles.	Excavation and disposal protects human health by reducing contamination from the residential properties. Some potential exists for contamination exposure from existing mine waste piles.	Excavation and disposal protects human health by reducing contamination from the residential properties. Some potential exists for contamination exposure from existing mine waste piles.	Excavation and off-site disposal protects human health by reducing the contamination from the residential properties. Some potential exists for contamination exposure from existing mine waste piles.
COMPLIANCE WITH ARARS					
Contaminant-specific	There is no mechanism for achieving ARARs.	Excavation and on-site disposal activities will be implemented to meet fugitive dust ARARs. Subsequent backfill with clean borrow material will minimize potential future exposure to remaining contaminated soils.	Excavation and on-site disposal activities will be implemented to meet fugitive dust ARARs. Subsequent backfill with clean borrow material will minimize potential future exposure to remaining contaminated soils.	Excavation and on-site disposal activities will be implemented to meet fugitive dust ARARs. Subsequent backfill with clean borrow material will minimize potential future exposure to remaining contaminated soils.	Excavation and off-site disposal activities will be implemented to meet fugitive dust ARARs. Subsequent backfill with clean borrow material will minimize potential future exposure to remaining contaminated soils.
Location-specific	There is no mechanism for achieving ARARs.	Location-specific ARARs regarding siting, endangered species, wetlands and historic preservation have been identified. Remedial action will be designed to achieve these ARARs.	Location-specific ARARs regarding siting, endangered species, wetlands and historic preservation have been identified. Remedial action will be designed to achieve these ARARs.	Location-specific ARARs regarding siting, endangered species, wetlands and historic preservation have been identified. Remedial action will be designed to achieve these.	No location-specific ARARs for the off-site repository. ARARs for excavation activities include endangered species, wetlands and historic preservation. Remedial action will be designed to achieve these ARARs.

Table 8-1

Detailed Analysis of Alternatives for Remediating Soil in Residential Sites

	Alternative 1 No Action	Alternative 4A Excavation/Disposal at Chief Mine No. 1	Alternative 4B Excavation/Disposal at Secondary Site near Eureka	Alternative 4C Excavation/Combination Disposal at Chief Mine No. 1 and Secondary Site Within Eureka	Alternative 5 Excavation/Disposal in Commercial Off-Site Repository
COMPLIANCE WITH ARARS					
Action-specific	There is no mechanism for achieving ARARs.	This alternative is expected to meet action-specific ARARs, including air emission through use of dust suppressants, covered dump trucks, and keeping streets clean during remedial activities. The repository would be managed in compliance with solid waste management ARARs.	This alternative is expected to meet action-specific ARARs, including air emission through use of dust suppressants, covered dump trucks and keeping streets clean during remedial activities. The repository would be managed in compliance with solid waste management ARARs and will comply with the off-site rule criteria under 40 CFR 300.440.	This alternative is expected to meet action-specific ARARs, including air emission through use of dust suppressants, covered dump trucks and keeping streets clean during remedial activities. The repository would be managed in compliance with solid waste management ARARs.	This alternative is expected to meet action-specific ARARs, including air emission through use of dust suppressants, covered dump trucks and keeping streets clean during remedial activities. The disposal facility would have to comply with the off-site rule criteria under 40 CFR 300.440.
LONG-TERM EFFECTIVENESS AND PERMANENCE					
Magnitude of residual risk	Without addressing the source, unacceptable exposure is likely.	This alternative provides long-term effectiveness by removing contaminated soil to a sufficient depth (18 inches) and backfilling the excavated area with clean material. The open cell concept provides a long-term disposal option for residential soil waste.	This alternative provides long-term effectiveness by removing contaminated soil to a sufficient depth (18 inches) and backfilling the excavated area with clean material. There would not be an open cell remaining to provide a long-term disposal option for residential soil waste.	This alternative provides long-term effectiveness by removing contaminated soil to a sufficient depth (18 inches) and backfilling the excavated area with clean material. The open cell concept provides a long-term disposal option for residential soil waste.	This alternative provides long-term effectiveness by removing contaminated soil to a sufficient depth (18 inches) and backfilling the excavated area with clean material. There would not be an open cell remaining to provide a long-term disposal option for residential soil waste.

Table 8-1

Detailed Analysis of Alternatives for Remediating Soil in Residential Sites

	Alternative 1 No Action	Alternative 4A Excavation/Disposal at Chief Mine No. 1	Alternative 4B Excavation/Disposal at Secondary Site near Eureka	Alternative 4C Excavation/Combination Disposal at Chief Mine No. 1 and Secondary Site Within Eureka	Alternative 5 Excavation/Disposal in Commercial Off-Site Repository
LONG-TERM EFFECTIVENESS AND PERMANENCE					
Adequacy and reliability of controls	This alternative does not minimize exposure.	This alternative should adequately remove areas of highest contamination and meet ARARs. Institutional controls will provide a moderate level of reliability for reducing future exposure to contaminated soils. Public health actions will help protect human health throughout remedial action.	This alternative should adequately remove areas of highest contamination and meet ARARs. Institutional controls will not be as reliable, due to lack of long-term disposal options. Public health actions will help protect human health throughout remedial action.	This alternative should adequately remove areas of highest contamination and meet ARARs. Institutional controls will provide a moderate level of reliability for reducing future exposure to contaminated soils. Public health actions will help protect human health throughout remedial action.	This alternative should adequately remove areas of highest contamination and meet ARARs. Institutional controls will not be as reliable, due to lack of long-term disposal options. Public health actions will help protect human health throughout remedial action.
REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT					
Treatment processes used and materials treated	None.	None.	None.	None.	None.
SHORT-TERM EFFECTIVENESS					
Impacts on community during remedial action	No remedial actions undertaken; therefore, there would be no short-term impacts on the community.	Potential for increased exposure to dust, contaminants, and increased localized truck traffic. Dust mitigation measures implemented to assist in mitigating fugitive dust to the extent possible. Traffic control plans developed to address risks posed by increased haul traffic.	Potential for increased exposure to dust, contaminants, and increased localized truck traffic. Dust mitigation measures implemented to assist in mitigating fugitive dust to the extent possible. Traffic control plans developed to address risks posed by increased haul traffic.	Potential for increased exposure to dust, contaminants, ands increased localized truck traffic. Dust mitigation measures implemented to assist in mitigating fugitive dust to the extent possible. Traffic control plan s developed to address risks posed by increased haul traffic.	Potential for increased exposure to dust, contaminants, and increased localized truck traffic. Dust mitigation measures implemented to assist in mitigating fugitive dust to the extent possible. Traffic control plans developed to address risks posed by increased haul traffic. Traffic impacts potentially greater to the public at large, as waste is transported over long distances.

Table 8-1

Detailed Analysis of Alternatives for Remediating Soil in Residential Sites

	Alternative 1 No Action	Alternative 4A Excavation/Disposal at Chief Mine No. 1	Alternative 4B Excavation/Disposal at Secondary Site near Eureka	Alternative 4C Excavation/Combination Disposal at Chief Mine No. 1 and Secondary Site Within Eureka	Alternative 5 Excavation/Disposal in Commercial Off-Site Repository
Impacts on workers during remedial action	No remedial actions undertaken; therefore, there would be no short-term impacts on workers.	Increased risk to workers via inhalation and dermal contact will be reduced to the extent possible through the implementation of a site-specific safety and health plan.	Increased risk to workers via inhalation and dermal contact will be reduced to the extent possible through the implementation of a site-specific safety and health plan.	Increased risk to workers via inhalation and dermal contact will be reduced to the extent possible through the implementation of a site-specific safety and health plan.	Increased risk to workers via inhalation and dermal contact will be reduced to the extent possible through the implementation of a site-specific safety and health plan.
Time until remedial objectives are achieved	Remedial objectives would not be met.	Construction activities are estimated to take 2-3 years to complete, depending on the level of funding.	Construction activities are estimated to take 2-3 years to complete, depending on the level of funding.	Construction activities are estimated to take 2-3 years to complete, depending on the level of funding.	Construction activities are estimated to take 2-3 years to complete, depending on the level of funding.
Environmental impacts	Environmental impacts would not change.	After the contaminants are excavated, backfilling and revegetation will mitigate future environmental impacts. Erosion control measures will be implemented to reduce surface water run-on/runoff impacts.	After the contaminants are excavated, backfilling and revegetation will mitigate future environmental impacts. Erosion control measures will be implemented to reduce surface water run-on/runoff impacts. Environmental impacts may be greater with this alternative due to the need to prepare the site for repository construction.	After the contaminants are excavated, backfilling and revegetation will mitigate future environmental impacts. Erosion control measures will be implemented to reduce surface water run-on/runoff impacts.	After the contaminants are excavated, backfilling and revegetation will mitigate future environmental impacts. Erosion control measures will be implemented to reduce surface water run-on/runoff impacts.
IMPLEMENTABILITY					
Ability to construct and operate	Not applicable.	Excavation is a common remedial action for removal of contaminated soils. Trees and shrubs may have to be removed and replaced.	Excavation is a common remedial action for removal of contaminated soils. Trees and shrubs may have to be removed and replaced.	Excavation is a common remedial action for removal of contaminated soils. Trees and shrubs may have to be removed and replaced.	Excavation is a common remedial action for removal of contaminated soils. Trees and shrubs may have to be removed and replaced.

Table 8-1
Detailed Analysis of Alternatives for Remediating Soil in Residential Sites

	Alternative 1 No Action	Alternative 4A Excavation/Disposal at Chief Mine No. 1	Alternative 4B Excavation/Disposal at Secondary Site near Eureka	Alternative 4C Excavation/Combination Disposal at Chief Mine No. 1 and Secondary Site Within Eureka	Alternative 5 Excavation/Disposal in Commercial Off-Site Repository
IMPLEMENTABILITY					
Availability of services and material	Not applicable.	While construction services are common and usually readily available, some factors to consider in relation to this site include the availability of backfill material, the need for soil amendments, and adequate sources of cover material.	While construction services are common and usually readily available, some factors to consider in relation to this site include the availability of backfill material, the need for soil amendments, and adequate sources of cover material.	While construction services are common and usually readily available, some factors to consider in relation to this site include the availability of backfill material, the need for soil amendments, and adequate sources of cover material.	While construction services are common and usually readily available, some factors to consider in relation to this site include the availability of backfill material and the need for soil amendments.
Ability to obtain approvals and coordination with other agencies	Not applicable.	CERCLA on-site actions are exempt from manifesting and reporting requirements. Coordination with state and local agencies will be required to implement institutional controls and public health actions.	Manifesting and reporting requirements will be met if deemed necessary for hauling to secondary site. Coordination with state and local agencies will be required to implement institutional controls and public health actions.	CERCLA on-site actions are exempt from manifesting and reporting requirements. These requirements will be met if deemed necessary for hauling to secondary site. Coordination with state and local agencies will be required to implement institutional controls and public health actions.	Documents for manifesting and properly disposing the material will be required. Coordination with state and local agencies will be required to implement institutional controls and public health actions.
COST					
Conceptual Capital Cost[1]	$0	$32,500,000	$34,700,000	$33,400,000	$44,700,000
Conceptual O&M Cost[2]	$0	$1,072,000	$608,000	$1,072,000	$407,000

Table 8-2

Cost Summary for Residential Alternatives

Alternative 1 - No Action **Capital Cost &** - $0 **O&M Cost** - $0	*No remedial action is proposed under this alternative.*
Alternative 4A - Excavation/Disposal at Chief Mine No. 1 **Capital Cost** - $32,500,000 **O&M Cost** - $1,072,000	• Excavated soil will be taken to Chief No. 1 Mine waste pile. • Chief No. 1 Mine waste pile will be re-graded and capped at completion of cleanup. • One cell at the Chief No. 1 Mine waste pile will remain open for disposal of contaminated soils from future development after EPA is finished with its cleanup.
Alternative 4B - Excavation/Disposal at Secondary Site near Eureka **Capital Cost** - $34,700,000 **O&M Cost** - $608,000	• Excavated soil to a secondary disposal site at a location within 6 miles of town. • Secondary disposal site will be re-graded and capped at completion of cleanup. • This alternative does not provide for disposal of contaminated soils which may be generated by future development after EPA finishes its cleanup.
Alternative 4C - Excavation/Combination Disposal at Chief Mine No. 1 and Secondary Site w/in Eureka **Capital Cost** - $33,400,000 **O&M Cost** - $1,072,000	• Excavated soil will be taken to both the Chief No. 1 Mine waste pile and to the Secondary disposal site within Eureka depending on available capacity of the Chief Mine No. 1 disposal site. • One cell at the Chief No. 1 Mine waste pile will remain open for disposal of contaminated soils from future development after EPA is finished with its cleanup.
Alternative 5 - Excavation/ Disposal in Commercial Off-Site Repository **Capital Cost** - $44,700,000 **O&M Cost** - $407,000	• Excavated soil would be hauled to a commercial licensed disposal facility. The nearest such facility is approximately 50-60 miles away. • This alternative does not provide for disposal of contaminated soils which may be generated due to future development after EPA finishes its cleanup.

Table 8-3

Detailed Analysis of Alternatives for Remediating Mine Waste Sites

	Alternative 1 No Action	Alternative 3A Excavation/Disposal at Chief Mine No. 1	Alternative 3B Excavation/Disposal at Secondary Site near Eureka	Alternative 5A Partial Excavation/Capping with Disposal at Chief Mine No. 1	Alternative 5B Partial Excavation/Capping with Disposal at Chief Mine No. 1 and Secondary Site within Eureka
OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT					
Direct contact/soil ingestion and inhalation	This alternative does not prevent inhalation or ingestion of contaminated soil.	Excavation and disposal protects human health and reduces exposure by consolidating materials in a repository designed with an engineered cover.	Excavation and disposal protects human health and reduces exposure by consolidating materials in a repository designed with an engineered cover.	Excavation and disposal protects human health and reduces exposure by consolidating materials in a repository designed with an engineered cover.	Excavation and disposal protects human health and reduces exposure by consolidating materials in a repository designed with an engineered cover.
COMPLIANCE WITH ARARs					
Contaminant- specific	There is no mechanism for achieving ARARs.	The alternative is expected to meet all contaminant-specific ARARs.	The alternative is expected to meet all contaminant-specific ARARs.	The alternative is expected to meet all contaminant-specific ARARs.	The alternative is expected to meet all contaminant-specific ARARs.
Location-specific	Not applicable.	Location-specific ARARs are expected to be met.	Location-specific ARARs are expected to be met.	Location-specific ARARs are expected to be met.	Location-specific ARARs are expected to be met.
Action-specific	Not applicable.	This alternative is expected to meet action-specific ARARs, including air emission through use of dust suppressants, covered dump trucks and keeping streets clean during remedial activities. The repository would be managed in compliance with solid waste management ARARs.	This alternative is expected to meet action-specific ARARs, including air emission through use of dust suppressants, covered dump trucks and keeping streets clean during remedial activities. The repository would be managed in compliance with solid waste management ARARs and will comply with the off-site rule criteria under 40 CFR 300.440.	This alternative is expected to meet action-specific ARARs, including air emission through use of dust suppressants, covered dump trucks and keeping streets clean during remedial activities. The repository would be managed in compliance with solid waste management ARARs.	This alternative is expected to meet action-specific ARARs, including air emission through use of dust suppressants, covered dump trucks and keeping streets clean during remedial activities. The repository would have to comply with the off-site rule criteria under 40 CFR 300.440.

Table 8-3

Detailed Analysis of Alternatives for Remediating Mine Waste Sites

	Alternative 1 No Action	Alternative 3A Excavation/Disposal at Chief Mine No. 1	Alternative 3B Excavation/Disposal at Secondary Site near Eureka	Alternative 5A Partial Excavation/Capping with Disposal at Chief Mine No. 1	Alternative 5B Partial Excavation/Capping with Disposal at Chief Mine No. 1 and Secondary Site within Eureka
LONG-TERM EFFECTIVENESS AND PERMANENCE					
Magnitude of residual risk	Without addressing the source, exposure remains likely.	This alternative provides long-term effectiveness by disposing of some material in an engineered repository.	This alternative provides long-term effectiveness by disposing of some material in an engineered repository.	This alternative provides long-term effectiveness by disposing of some material in an engineered repository. The remaining waste is capped in place, effectively reducing future contact or erosion.	This alternative provides long-term effectiveness by disposing of some material in an engineered repository. The remaining waste is capped in place, effectively reducing future contact or erosion.
Adequacy and reliability of controls	This alternative does not minimize exposure.	This alternative should adequately remove areas of highest contamination and meet ARARs. Institutional controls will provide a moderate level of reliability for reducing future exposure to contaminated soils.	This alternative should adequately remove areas of highest contamination and meet ARARs. Institutional controls will provide a moderate level of reliability for reducing future exposure to contaminated soils.	This alternative should adequately remove areas of highest contamination and meet ARARs. Institutional controls will provide a moderate level of reliability for reducing future exposure to contaminated soils. Long-term inspection and maintenance of multiple disposal areas will be required.	This alternative should adequately remove areas of highest contamination and meet ARARs. Institutional controls will provide a moderate level of reliability for reducing future exposure to contaminated soils. Long-term inspection and maintenance of multiple disposal areas will be required.
REDUCTION OF TOXICITY, MOBILITY OR VOLUME THROUGH TREATMENT					
Treatment processes used and materials treated	None.	None.	None.	None.	None.

Table 8-3

Detailed Analysis of Alternatives for Remediating Mine Waste Sites

	Alternative 1 No Action	Alternative 3A Excavation/Disposal at Chief Mine No. 1	Alternative 3B Excavation/Disposal at Secondary Site near Eureka	Alternative 5A Partial Excavation/Capping with Disposal at Chief Mine No. 1	Alternative 5B Partial Excavation/Capping with Disposal at Chief Mine No. 1 and Secondary Site within Eureka
SHORT-TERM EFFECTIVENESS					
Impacts on community during remedial action	No remedial actions undertaken; no short-term impacts on the community.	Potential for increased exposure to dust, contaminants, and a significant increase in localized truck traffic. Dust mitigation measures implemented to assist in mitigating fugitive dust to the extent possible. Traffic control plans developed to address risks posed by increased haul traffic. The time to implement would be longer.	Potential for increased exposure to dust, contaminants, and a significant increase in localized truck traffic. Dust mitigation measures implemented to assist in mitigating fugitive dust to the extent possible. Traffic control plans developed to address risks posed by increased haul traffic. The time to implement would be longer.	Potential for increased exposure to dust, contaminants, and increased localized truck traffic. Dust mitigation measures implemented to assist in mitigating fugitive dust to the extent possible. Traffic control plans developed to address risks posed by increased haul traffic.	Potential for increased exposure to dust ,contaminants, and increased localized truck traffic. Dust mitigation measures implemented to assist in mitigating fugitive dust to the extent possible. Traffic control plans developed to address risks posed by increased haul traffic.
Impacts on workers during remedial action	No remedial actions undertaken; no short-term impacts on workers.	Increased risk to workers via inhalation and dermal contact reduced to the extent possible by implementation of a site-specific safety and health plan.	Increased risk to workers via inhalation and dermal contact reduced to the extent possible by implementation of a site-specific safety and health plan.	Increased risk to workers via inhalation and dermal contact reduced to the extent possible by implementation of a site-specific safety and health plan.	Increased risk to workers via inhalation and dermal contact reduced to the extent possible by implementation of a site-specific safety and health plan.
Time until remedial objectives are achieved	Remedial objectives would not be met.	Construction activities are estimated to take 2-3 years to complete, depending on the level of funding.	Construction activities are estimated to take 2-3 years to complete, depending on the level of funding.	Construction activities are estimated to take 2-3 years to complete, depending on the level of funding.	Construction activities are estimated to take 2-3 years to complete, depending on the level of funding.

Table 8-3

Detailed Analysis of Alternatives for Remediating Mine Waste Sites

	Alternative 1 No Action	Alternative 3A Excavation/Disposal at Chief Mine No. 1	Alternative 3B Excavation/Disposal at Secondary Site near Eureka	Alternative 5A Partial Excavation/Capping with Disposal at Chief Mine No. 1	Alternative 5B Partial Excavation/Capping with Disposal at Chief Mine No. 1 and Secondary Site within Eureka
Environmental impacts	Environmental impacts would not change.	Erosion control measures implemented to reduce surface water run-on/runoff impacts. Revegetation would take place where needed.	Erosion control measures implemented to reduce surface water run-on/runoff impacts. Environmental impacts may be greater due to preparation of a site for repository construction. Revegetation would take place where needed.	Erosion control measures implemented to reduce surface water run-on/runoff impacts. Revegetation would take place where needed.	Erosion control measures implemented to reduce surface water run-on/runoff impacts. Revegetation would take place where needed.
IMPLEMENTABILITY					
Ability to construct and operate	Not applicable.	Alternative presents issues with implementation. While technically feasible to implement, the outcome would be less desirable. Consolidation of material @ Chief Mine No. 1 would create a huge pile in the center of Eureka. Would require extended implementation period	Excavation is a common remedial action for removal of contaminated soils and is readily implemented.	Excavation is a common remedial action for removal of contaminated soils and is readily implemented. Capping of mine waste is not expected to be difficult to implement. Removal of some portion of waste makes capping feasible for waste piles with steep slopes and high angles of repose.	Excavation is a common remedial action for removal of contaminated soils and is readily implemented. Capping of mine waste is not expected to be difficult to implement. Removal of some portion of waste makes capping feasible for waste piles with steep slopes and high angles of repose.
Availability of services and material	Not applicable.	While construction services are common and usually readily available, some factors to consider in relation to this site include adequate sources of cover material.	While construction services are common and usually readily available, some factors to consider in relation to this site include adequate sources of cover material.	While construction services are common and usually readily available, some factors to consider in relation to this site include adequate sources of cover material.	While construction services are common and usually readily available, some factors to consider in relation to this site include adequate sources of cover material.

Table 8-3

Detailed Analysis of Alternatives for Remediating Mine Waste Sites

	Alternative 1 No Action	Alternative 3A Excavation/Disposal at Chief Mine No. 1	Alternative 3B Excavation/Disposal at Secondary Site near Eureka	Alternative 5A Partial Excavation/Capping with Disposal at Chief Mine No. 1	Alternative 5B Partial Excavation/Capping with Disposal at Chief Mine No. 1 and Secondary Site within Eureka
Ability to obtain approvals and coordinate with other agencies	Not applicable.	CERCLA on-site actions are exempt from manifesting and reporting requirements. Coordination with state and local agencies will be required to implement institutional controls.	Would require compliance with EPA's off-site rule which would likely entail a delay in commencing cleanup while the appropriate requirements were met. Coordination with state and local agencies will be required to implement institutional controls.	Coordination with state and local agencies will be required to implement institutional controls.	Coordination with state and local agencies will be required to implement institutional controls.
COST					
Conceptual capital cost	$0	$27,000,000	$39,600,000	$25,900,000	$27,500,000
Conceptual O&M cost	$0	$436,000	$434,000	$380,000	$380,000

Table 8-4

Cost Summary for Mine Waste Alternatives

Alternative 1 - No Action **Capital Cost** - $0 **O&M Cost** - $0	No remedial action is proposed under this alternative.
Alternative 3A - Excavation/Disposal at Chief Mine No. 1 **Capital Cost** - $ $27,000,000 **O&M Cost** - $436,000	• Mine waste will be excavated and consolidated at the Chief No. 1 Mine waste pile. Contaminated soils excavated from non-residential areas will also be taken to the Chief No. 1 Mine waste pile. • Excavated areas will be re-graded for drainage, backfilled with clean soil and re-vegetated to prevent erosion.
Alternative 3B - Excavation/Disposal at Secondary Site near Eureka **Capital Cost** - $39,600,000 **O&M Cost** - $434,000	• Mine waste will be excavated and consolidated at a Secondary Site. Contaminated soils excavated from non-residential areas will also be taken to the Secondary Site at a location within 6 miles of town. • Excavated areas will be re-graded for drainage, backfilled with clean soil and re-vegetated to prevent erosion.
Alternative 5A - Partial Excavation/Capping with Disposal at Chief Mine No 1. **Capital Cost** - $25,900,000 **O&M Cost** - $380,000	• Some mine waste areas may be partially or fully excavated while other mine waste piles will be re-graded and capped in-place. • Excavated materials will be taken to the Chief Mine No.1 waste pile for disposal and the Chief Mine No.1 waste pile will be capped once all areas have been cleaned up.
Alternative 5B - Partial Excavation/Capping with Combination Disposal at Chief Mine No 1 and Secondary Site w/in Eureka. **Capital Cost** - $27,500,000 **O&M Cost** - $380,000	• The only difference between Alternative 5A and this alternative is that the mine waste not left in-place could be taken to either the Chief Mine No. 1 or a secondary disposal site located in Eureka.

9.0 PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practical, and engineering controls, such as containment, for wastes that pose a relatively low, long-term threat. A principal threat waste concept is applied to the characterization of "source material" at a Superfund site. Source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to the groundwater, surface water or air, or acts as a source for direct exposure. EPA has defined principal threat waste as those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur (e.g., liquids, drummed non-liquid waste, volatiles). Low level threat wastes are those source materials that generally can be contained and that would present only a low risk in event of release. They include source material that exhibit low toxicity, low mobility in the environment or are near health-based levels (e.g., non-mobile contaminants in soil).

The mine waste piles and residential soils are considered low level threat wastes that can be reliably contained through the use of engineering controls. The principal threats from these sources are potential inhalation and ingestion risks posed by direct contact with the material or exposure to lead dust that may accumulate in the homes. Excavation and disposal of contaminated residential soils and subsequent backfilling with clean material, and capping of mine waste piles are effective engineering controls that can be implemented to reduce the exposure of residents from these low level threat materials.

10.0 SELECTED REMEDY

This section describes the Selected Remedy in further detail than that given in the Description of Alternatives. The following subsections describe the Selected Remedy in further detail, give the rationale for the Selected Remedy, provide a summary of the remedy costs and the expected outcomes of the Selected Remedy. It is expected that the remedy may change somewhat as a result of the remedial design and construction process. Any such changes to the remedy will be documented in a technical memorandum in the Administrative Record, an Explanation of Significant Differences or a Record of Decision Amendment depending upon the nature and scope of the change.

EPA and UDEQ selected the following remedy for the final Site cleanup of lead-contaminated soils:

- For residential soils, **Alternative 4C - Excavation and Combination Disposal at Chief Mine No. 1 and Secondary Site**

- For mine waste piles and non-residential areas, **Alternative 5B - Partial Excavation and Capping with Combination Disposal at Chief Mine No. 1 and Secondary Site.**

10.1 Description of the Selected Remedy

RESIDENTIAL AND COMMERCIAL AREAS:

The selected remedy for residential and commercial areas in Eureka includes the following elements which are described below.

1. **Cleanup of Lead-contaminated Soils in Yards -**

   A. **Property Site Planning:**

   ▪ Prior to conducting cleanup of a residential yard, a plot plan will be developed in consultation with the property owner to fully define what will be done on the property. This will include an agreement for access, additional sampling needed to further characterize the extent and depth of contaminated areas, identification of items that will be removed or disposed of as garbage and identification of landscaping features to be retained, removed or replaced. Work will not commence without the property owner's agreement with the plot plan.

   ▪ At the conclusion of the cleanup, a review of the plot plan will be made with the property owner, who will sign off after agreeing that the cleanup is complete. At that time, information will be provided to the owner with instructions on maintaining the integrity of the soil cap and to explain the purpose of institutional controls.

B. **Performance Standards for Excavation:**

- Contaminated soils are defined as soils with lead levels greater than 231 ppm or with COPCs elevated above the PRGs. Because other COPCs are co-located with lead, addressing the lead contaminated soils will also address these COPCs. Commercial areas will be addressed as part of the residential cleanup since they are adjacent to the residential areas and children frequently play there.

- The top eighteen inches of soil will be excavated from contaminated areas unless sampling shows that the contamination does not extend that deep. The bottom of the excavation will be sampled prior to backfilling to document whether contaminated soils are present below the clean soil cover. Areas below 18 inches will not be excavated even if contamination extends below that depth. Where the stability of a structure is in question, excavation around the structure may be limited to prevent de-stabilization. In those instances, a concrete apron or other appropriate soil barrier may be installed.

- The reason for excavating 18 inches rather than the more typical excavation depth of 12 inches is based on the fact that the City of Eureka has limited resources for implementing and administering institutional controls. An additional six inches of soil cover reduces the chance of the cover eroding away before the City is able to assess the situation and require a property owner to take corrective action. Although the soil cover will be revegetated, maintenance of a healthy vegetative cover by all property owners in Eureka is not guaranteed once remedial action is completed.

- Soils in vegetable gardens will be replaced up to a depth of 24 inches if sampling results indicate contamination extends that deep.

C. **Backfill:**

- Excavations will be backfilled with clean soil. Backfill material will be tested on a regular basis to ensure that it is free of contaminants and that the topsoil will be a suitable growth medium for establishing vegetation. Lead concentrations in the backfill and topsoil material will not exceed 100 ppm.

D. **Re-vegetate and Replace:**

- Residential yards will be revegetated with drought tolerant plant species native to Utah. Revegetation is important to limit erosion and to help maintain the integrity of the soil cover. Because of the difficulty in establishing new trees in a high altitude, arid climate, removal of well established trees which provide shade and windbreaks from the harsh weather elements in Eureka will be avoided.

- Fencing will be replaced or re-installed, if removed. Gravel will be replaced or installed for driving areas. If concrete is present and is in poor condition, it will be patched or replaced.

2. Disposal of Contaminated Soils -

A. **Excavation Soil During Remedial Action:**

▪ Contaminated soil will be taken to one of the two on-site repositories - either the repository at the Chief Mine No. 1 waste pile or at an alternate repository location that will be selected during remedial design in consultation with Chief Consolidated Mining Company. Both on-site repositories will be capped following completion of the residential cleanup.

▪ In allocating the disposal of contaminated soils to each of the repository locations, the decision will be based on but not limited to the following criteria - capacity, stability, waste consolidation, need to remediate an alternate location, and historic preservation.

B. **Open Cell for Future Disposal:**

▪ As part of developing and implementing institutional controls, a plan will be created for operating an open cell at a repository in Eureka for the sole purpose of disposal of contaminated soils. Because the City and County have limited financial resources, the plan will also address the provision of financial resources to operate and maintain the open cell.

▪ The purpose of an open cell will be to provide a disposal site for residents and the City to dispose of contaminated soils in a controlled location to prevent re-contamination of the cleaned up residential areas.

▪ Some clean soil (cover material) will be stockpiled in a suitable location to cover the contaminated soils disposed of in the open cell at the close of each season. A guide for operating and maintaining the open cell will be developed.

3. Public Health Actions -

Public health actions will be implemented by State and regional public health agencies in coordination with EPA and UDEQ remediation efforts. Public health actions include the following components which continue until the remedial action is completed and until blood lead levels in children decrease below 10 micrograms per deciliter (µg/dL).

A. **Monitoring:**

▪ A voluntary blood lead testing program will be offered for all children in Eureka less than 18 years of age. For children with blood lead levels greater than 10 µg/dL, public health officials will perform follow-up monitoring as well as frequent individual counseling for families of these children. The monitoring program will continue throughout the remedial action and for 1-2 years after remedial action completion. Repeated blood lead testing in children is important because their risk of exposure

changes as they develop and their play environment changes. The purpose of the blood lead testing will be to track blood levels in children over time and to provide a means of evaluating the effectiveness of the remediation and public health actions.

B. **Health Education:**

- EPA and UDEQ in cooperation with public health agencies will work with the community to develop a focused educational outreach program for the Eureka Community and its schools. The health education program will focus on a variety of audiences and ways to inform parents, teachers and children about the hazards of lead in the environment and identify steps that can be taken to prevent exposure to lead contamination.

C. **In-home Evaluations:**

- A voluntary comprehensive evaluation of individual home sites, including soil and in-home dust sampling will be offered where a child has a blood lead level greater than 10 µg/dL. The purpose of an in-home evaluation is to focus on identifying the potential exposures in a home where children with elevated blood lead level are living. In certain circumstances, if interior environmental sampling indicates elevated lead levels (>231 ppm) in household dust, with the homeowner's permission measures may be taken to remove the household dust. Close coordination between EPA, UDEQ, and the public health agencies will be required to determine when an in-home evaluation is necessary.

D. **HEPA Vacuum Program:**

- A program with the City will be developed to loan out HEPA vacuums to residents who are concerned about the accumulation of household dust with elevated lead levels. These vacuums are specially equipped with a high-efficiency particulate air (HEPA) filter for the removal of lead-contaminated dust. EPA will purchase several of these HEPA vacuums which will be given to the City of Eureka to be loaned out to residents. Guidelines on the proper use of HEPA vacuums and cleaning of the interior of homes to remove lead contaminated dust will be developed for the residents' use.

4. **Institutional Controls -**

- Institutional controls (e.g.; zoning and/or building ordinances) will be developed jointly with State, City and County officials to control the handling and disposal of contaminated soils that may be excavated during future construction activities. The most likely mechanism would be through building permits issued by local government.

- The purpose of the institutional controls is not to prevent owners from developing their property but to ensure proper handling and disposal of contaminated soils and to provide a designated disposal site.

MINE WASTE AND NON-RESIDENTIAL AREAS:

The selected remedy for mine waste areas and non-residential areas in and around the City of Eureka includes the following elements which are described below.

1. **Performance Standards -**

   ▪ The cleanup level for mine waste areas and non-residential areas is defined as areas where lead concentrations in soils are greater than 735 ppm lead. Because other COPCs are generally co-located with lead, addressing lead contaminated areas will also address these COPCs. The cleanup goal for these areas was based on a recreational exposure scenario because people do not live on these properties.

2. **Mine Waste Piles -**

   The mine waste piles identified for remediatation include the May Day Mine, Godiva Tunnel and Godiva Mine, Chief Mine No. 2; Chief Mill No. 1, Chief No.1 Mill Tailings, Chief Mill Site No. 1, Chief Mine No. 1, Eagle and Blue Bell Mine, Eagle and Blue Bell Transition Zone and Dump, Snowflake Mine Dump, Gemini Mine, Bullion Beck Mine and Bullion Beck Mill, Eureka Hill Waste Rock and the Eureka Hill Drainage.

   A. **Grading of Existing Piles:**

   ▪ The goal of remediating the mine waste piles is to move as little material as possible from one location to another. Therefore, most mine waste piles will be capped in-place.

   ▪ All mine waste piles will be graded to stable slopes. In some instances, small mine waste piles may be re-located and consolidated where consolidation would be a more efficient and effective remedy. In other instances, a portion of a large mine waste pile may be moved to another location to achieve stable slopes. Slope stability and decisions to move mine waste from one location to another will be made during remedial design.

   B. **Dust Control:**

   ▪ Prior to remedial action, temporary measures may be implemented to control dust from some of the large mine waste pile. Dust surfactants or other soil amendments may be applied to the surface to prevent blowing dust. Such measures will be evaluated during design in terms of effectiveness and cost. Prior to remedial action a plan to minimize environmental impacts from all aspects of the cleanup will be developed which will include air monitoring and dust control.

   C. **Waste Pile Cover:**

   ▪ Mine waste piles will be covered with either a rock or vegetative cover designed to prevent dust blowing or surface water runoff. In most instances, rock cover is the preferred

cap because of the difficulty of establishing vegetation on reclaimed mine waste piles in the Eureka area and the potential for erosion to occur. The final decision as to the type of cap will be made during remedial design.

- Factors that will be considered in covering mine waste areas include slope stability, historical features, and available capacity for containing the mine waste materials. Surface run-on and run-off controls will be incorporated into the design of each mine waste pile.

3. **Non-Residential Areas -**

The non-residential areas included for remediation are DM-6, DM-10, DM-22 and DM-25.

- Non-residential areas primarily in the southeast quadrant of the Site present a unique problem. Currently, the areas are heavily vegetated which stabilizes the contaminated soils. The areas are also crossed with several corridors frequented by motorized recreational vehicles. The soils and dust along these corridors present an exposure risk to recreational users.

- EPA has concerns about the ability to successfully re-vegetate these areas after the contaminated soils have been removed due to the arid, windy and exposed conditions and the motorized recreation. Because this is a sizeable open area, there is potential for dust control problems to arise.

- EPA will take response actions to address lead contamination in these non-residential areas in one of two ways: **1)** excavate and dispose of lead contaminated soils up to a depth of 18 inches or **2)** leave lead contaminated soils in place with appropriate institutional controls until a deferred cleanup can be undertaken by individual property owners at the time of development. In assessing whether to perform cleanup activities now as opposed to a deferred cleanup, EPA will work closely with the State, the community and with the property owners involved.

- If cleanup is deferred until development, EPA will consider the potential for building a travel corridor through such properties with the property owners' consent to minimize exposure to off-road vehicle users to contaminated soils.

- EPA and the State will also work with the community to find non-contaminated areas for motorized recreation to reduce exposures to lead contaminated soils.

4. **Institutional Controls:**

- Institutional controls will be implemented in cooperation with the State and local government at all mine waste areas. Institutional controls may include zoning and building ordinances as well as deed restrictions on mine waste areas to ensure protection of the remedy and avoid inappropriate uses.

- For non-residential areas, institutional controls may include zoning and building ordinances and in some cases, deed restrictions and notices.

10.2 Rationale for the Selected Remedy

At most other mining sites with lead contamination, the risk of elevated blood lead levels is a potential risk not an actual risk. At this Site, approximately 40 children have been identified with elevated blood lead levels in a town of 800 residents. This Site is of special concern to EPA and UDEQ because of the number of children with elevated blood lead levels. The Selected Remedy for Eureka is more conservative than the remedies at some other mining sites. EPA and the State's rationale for the Selected Remedy and the cleanup levels in this remedy is discussed below.

1. **Residential Cleanup Level:**

   EPA and UDEQ selected a cleanup level of 231 ppm lead in soil for residential areas. Using the IEUBK model, a PRG of 231 ppm for lead was calculated based on the same input parameters to calculate the risk. Generally, a PRG is the starting point and other risk management factors enter into the final decision on the cleanup level selected by EPAand UDEQ. Usually, the selected cleanup level is higher than the calculated PRG. Due to the risk at Eureka, EPA and UDEQ decided that a conservative cleanup level was warranted based on the following factors:

   - The lead in Eureka soils is highly soluble and bioavailable. In addition, there are high concentrations of lead associated with very small soil particles, which behave more like dust than soil. This is important because at typical mining sites, the lead has bonded with minerals in the soil and does not move as readily into homes, onto children's hands or into the air. In Eureka, however, the soil/dust particles are highly transportable, and some of the high concentrations of lead in homes appears to be coming from sources other than the soils in the immediate yard.

   - The behaviors and recreational activities of the children (< 7 years) and adolescents (7-18 years) appear to be a factor in the number of elevated blood lead levels in Eureka. Interviews conducted during the blood lead study identified a positive correlation between hand to mouth activity and elevated blood lead levels. It has been observed that many adolescents frequently ride motorized recreational vehicles (dirt biking and ATVs) in areas that are heavily contaminated with lead. These behaviors and activities provide frequent opportunities for direct contact with contaminated soils, resulting in ingestion and inhalation of high amounts of soil and dust.

   - Because of the significant number of children in Eureka with elevated blood lead levels (both below seven years of age and 7-18 years of age), EPA and the State believe it is important to take a conservative approach. The impact of lowering the action level for lead in soil from 400 ppm to 231 ppm would require an additional 34 homes to be cleaned up.

2. Recreational Cleanup Level:

EPA and the State selected a cleanup level of 735 ppm lead in non-residential soils and mine waste areas. EPA used the Bower's model to evaluate lead PRGs for adolescent recreational users at this Site using the same input parameters to calculate the risk. The type and frequency of recreational activity in Eureka were parameters specifically considered in calculating the PRGs for recreational exposure. In the risk assessment, EPA assumed a much higher frequency of exposure than is normally assumed for recreational activity based on the following factors specific to Eureka.

▪ Many adolescents (primarily boys) in Eureka engage in motorized vehicle recreation (dirt bikes and ATVs) which stirs up a tremendous amount of dust. Since there is a lack of other recreational opportunities, many of these children engage in this activity on a fairly frequent basis - in some cases three to four times per week and for several hours each day. The elevated blood lead levels for children in Eureka between 7 and 18 years of age, showed a considerable number of boys with elevated blood lead levels. Normally, elevated blood lead levels in children above 7 years of age are much less common.

▪ The same factors that make lead in Eureka's soil so available to residents also make it available to recreational users, such that individuals may be exposed to levels well beyond the normal recreational scenario. Based on the frequency of potential exposure, EPA and the State decided on the calculated PRG for recreational exposure as the cleanup level for non-residential and mine waste areas.

3. Selected Remedy:

EPA and UDEQ selected Alternative 4C for residential areas and Alternative 5B for mine waste areas - collectively referred to as the remedy - for the following reasons:

- The remedy is protective of human health because it breaks the primary exposure pathway to lead contaminated soils by providing a clean soil-vegetative protective barrier that prevents direct contact. Contaminated soils in residential yards will be replaced with clean soil and revegetated while the major source of the contamination - the mine waste piles - will be capped with a soil/rock cover. Preventing direct contact with contaminated soil and dust is expected to reduce the elevated blood lead levels measured in a significant number of children in Eureka. Remediating residential yards and capping mine waste piles are routine approaches to preventing direct contact with contaminated soils.

- The remedy includes public health actions that are intended to increase the public's awareness of the risks of lead exposure and what they can specifically do to minimize their children's exposure to lead. Public health actions are also intended to raise the community's awareness of how they can maintain the protectiveness of the remedy once it is completed.

- The remedy provides a degree of long term effectiveness by placing an 18 inch cover of clean soil and by implementing institutional controls to ensure that any contaminated soils that are excavated during future construction activities are properly handled and disposed of to avoid re-contamination. The remedy provides an open cell at the repository for the proper future disposal of contaminated soils.

- The remedy also addresses open areas in Eureka and the immediate vicinity of Eureka that are frequented by residents on motorized recreational vehicles. While not every mine waste area in the Tintic Mining District will be addressed, it is expected that a significant reduction in the exposure to lead contaminated soils will result from addressing the areas in and immediately adjacent to Eureka.

- The remedy is implementable, reasonably cost-effective and will minimize to the extent feasible the impacts to the community. The remedy for the mine waste areas will also provide the opportunity for preservation of historic features such as head frames that the community has expressed a desire to preserve.

10.3 Summary of the Estimated Remedy Costs

Tables 10-1, 10-2 and 10-3 present a summary of the estimated costs to implement the Selected Remedy for the residential and mine waste areas. The cost summary represents both capital and O&M costs for a 30-year period. The information in these tables is based on the best available information regarding the anticipated scope of the remedial actions. Changes to the cost estimates may occur as a result of new information and data collected during the engineering design of the remedial alternatives. Major changes may be documented in the form of a memorandum in the Administrative Record or ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

Key cost assumptions used in developing the remedy costs include: (1) a 30-year operations and maintenance period; (2) a three year construction period; and (3) use of rock for repository and mine waste pile covers. An average of 11,000 square feet of yard space was assumed for residential excavation/backfilling costs. Net present worth values of 5% are presented. These values discount all future costs associated with the remedial action to a common base year (i.e., present year) and allow costs to be compared on the basis of a single figure representing the amount of money that, if invested in the base year, would be sufficient to cover the costs of all remedial action planned for the Site.

10.4 Expected Outcome of the Selected Remedy

Eureka is a small residential community that was built during the mining era from the late 1880s to the 1960s. Most land use in Eureka is residential with only a few commercial properties primarily in the downtown area and abandoned mine waste piles surrounding the town. Residents, with a few exceptions, commute to Provo, Tooele, or Dugway Proving Grounds for work. As Eureka grows, it is anticipated that there may be some new businesses or commercial enterprises, but the major land use type will remain residential.

A reduction in blood lead levels in the community especially children younger than 7 years of age is the expected outcome of the Selected Remedy. The goal of the remedial action is to reduce the risk of exposure to lead contaminated soils and dust through several actions. The Selected Remedy - residential soil cleanup and containment of mine waste piles- is a routine remedial approach that has been implemented successfully at numerous mining sites. Remediating residential yards will reduce the risk of exposure through incidental ingestion of lead in soil.

Mine waste areas surrounding the edge of town which are considered to be the primary source of the contamination will be capped with clean soil and cover material, which have been tested to show that they contain less than100 ppm lead. This will reduce the amount of wind blown lead contaminated dust that is currently being generated from waste piles, accumulating in homes and settling in residential yards and streets. Capping these lead contaminated materials is expected to reduce direct contact with contaminated soils and dust.

In addition, public health education and institutional controls are expected to help address residents' living and recreational habits that may be contributing to their exposure to contaminated materials. In particular, motorized vehicle recreation is a major pursuit of adolescents and pre-teens in Eureka. Many of their routes around town go through areas where soils have high levels of lead contamination, and also travel over actual mine waste areas. The community has shown an interest in constructing a motor-cross track in an area near town where soils are not contaminated with lead. EPA will work with the community to increase peoples' awareness about the risks associated with lead and ways to minimize exposure.

Not all contaminated soils and mine waste will be completely removed, hence, the remedy will require measures to ensure its long term effectiveness. Institutional controls will help to minimize the potential for re-contamination of residential soils by controlling the excavation and disposal of contaminated soils through the issuance of building permits for construction activities. To ensure that excavated contaminated soils are properly disposed of, an open cell at the on-site repository will be maintained for the convenience of the residents. Because of the limited resources of the City and the County, EPA and the State expect that additional financial resources will be needed to assist local government in the development and implementation of such institutional controls and operation of the on-site repository.

Table 10-1
Cost Breakdown for Selected Remedy, Residential Areas

Activity	Total
Prepare individual sites for waste removal activities	$793,912.00
Perform soil removal activities	$3,186,859.00
Haul contaminated waste to repositories	$997,029.00
Perform topsoil replacement activities	$3,226,337.00
Restore properties	$1,445,372.00
Property inspection/signoff	$68,880.00
Perform borrow area restoration	$4,030,205.00
Mobilization (5%)	$687,430.00
Subtotal direct capital costs (remove/replace soil)	$13,748,594.00
Health and safety supervisor (10%)	$971,783.00
PPE (2%)	$194,357.00
Construction supervision (25% of labor)	$2,429,456.00
Construction management (10%)	$1,374,860.00
Engineering/Administration (25%)	$3,437,148.00
Subtotal indirect capital costs	$9,095,033.00
Contingency (20%)	$4,568,725.00
Subtotal direct and indirect capital costs	$27,412,352.00
Secondary onsite repository construction/closure **	$959,647.00
Chief Mine No. 1 repository operations (during remediation and closure)**	$222,190.00
Contractor profit	$1,715,651.00
USACE project management	$1,217,101.00
Public health actions and watering	$1,844,567.00
Total capital costs (NPV 5%)	**$33,371,509.00**
Repository cell maintenance (NPV 5%)	$663,911.00
Institutional Controls (NVP 5%)	$407,677.00
Total Project Costs (30 years at NVP 5%)	**$34,443,000.00**

** line items include direct/indirect costs

Table 10-2
Cost Breakdown for Selected Remedy, Total Mine Waste Areas

Activity	Total
Prepare individual waste sites for waste removal activities	$35,693.00
Perform soil removal activities	$1,514,905.00
Haul contaminated mine waste to Chief	$2,081,433.00
Cap Installation	$1,550,949.00
Perform topsoil replacement activities	$312,800.00
Restore Property	$2,142,670.00
Secondary On-Site Repository Construction	$410,000.00
Repository Operations	$2,787,975.00
Perform Borrow Area Restoration	$232,790.00
Field Mobilization	$70,942.00
Field Demobilization	$59,542.00
Field Overhead & TDY	$2,967,630.00
Subtotal Direct Capital Costs	$13,625,028.00
Health & Safety (10 % of labor)	$634,762.00
PPE (2 % of labor)	$126,952.00
Construction Supervision (25% of labor)	$1,586,905.00
Construction Management (10%)	$1,362,503.00
Engineering/Administration (25%)	$3,406,257.00
Subtotal Indirect Capital Costs	$7,117,379.00
Contingency (20%)	$4,148,481.00
Subtotal Direct and Indirect Capital Costs	$24,890,888.00
Contractor Profit	$1,493,453.00
Total Contract Costs	$26,384,341.00
USACE Project Management	$1,187,660.00
Total Capital Costs	**$27,572,001.00**
Institutional Controls (NVP 5%)	$56,598.00
Operations and Maintenance (NVP 5%)	$323,711.00
Total Costs (NVP 5%)	**$27,952,310.00**

Table10-3
Cost Breakdown f or Selected Remedy, Individual Mine Waste Areas

ACTIVITIES / DESCRIPTION	May Day/ Godiva	Chief Mine No. 1	Chief Repository	Chief Mill Sites	Eagle & Blue Bell	Non-Residential DM - 22	Gemini	Bullion Beck Mine	Bullion Beck Mill	Eureka Hill	Non-Residential DM - 6, 10, 25	Secondary Repository	Mob/ Demob
Prepare individual waste sites for waste removal activities	3,756	3,919		3,473	5,066	1,420	2,913	1,998	2,287	4,633	6,229		
Perform soil removal activities	624,001			32,120	280,252		253,446	38,641	123,221	89,504	73,720		
Haul Contaminated Mine Wastes to Chief	785,969			39,207	530,138		319,620	48,730	154,991	112,873	89,904		
Cap Installation					551,309	73,469	348,768	93,015		484,389			
Perform top soil replacement activities	58,220			69,246					26,783		158,551		
Restore Property	3,143			4,271	654,177	98,657	516,476	137,351	1,281	717,520	9,794		
Secondary On-site Repository Construction												410,000	
Repository Operations		1,947,945	107,998									732,032	
Perform Borrow Area Restoration	2,169	28,185		2,947	116,166	2,486	105,054	16,017	884	37,100	6,757	6,026	
Field Mobilization													70,942
Field Demobilization													59,542
Field Overhead & TDY	529,558	454,067	30,867	56,357	563,268	40,934	400,780	84,269	111,364	344,834	128,021	148,961	74,350
Subtotal Direct Capital Costs	2,006,816	2,434,115	138,865	207,622	2,600,692	216,965	1,855,016	407,465	420,810	1,771,830	472,976	887,019	204,835
Health & Safety (10% of labor)	113,270	97,123	6,602	12,054	120,480	8,756	85,725	18,025	23,820	73,758	27,383	31,862	15,903
PPE (2% of labor)	22,654	19,425	1,320	2,411	24,096	1,751	17,145	3,605	4,764	14,752	5,477	6,372	3,181
Construction Supervision (25% of labor)	283,175	242,807	16,506	30,136	301,201	21,889	214,313	45,062	59,550	184,396	68,458	79,655	39,758

Table10-3
Cost Breakdown f or Selected Remedy, Individual Mine Waste Areas

ACTIVITIES / DESCRIPTION	May Day/ Godiva	Chief Mine No. 1	Chief Repository	Chief Mill Sites	Eagle & Blue Bell	Non-Residential DM - 22	Gemini	Bullion Beck Mine	Bullion Beck Mill	Eureka Hill	Non-Residential DM - 6, 10, 25	Secondary Repository	Mob/ Demob
Construction Management (10%)	200,682	243,412	13,887	20,762	260,069	21,697	185,502	40,746	42,081	177,183	47,298	88,702	20,484
Engineering/Administration (25%)	501,704	608,529	34,716	51,905	650,173	54,241	463,754	101,866	105,203	442,958	118,244	221,755	51,209
Subtotal Indirect Capital Costs	1,121,484	1,211,295	73,032	117,269	1,356,020	108,333	966,438	209,304	235,418	893,046	266,859	428,346	130,534
Contingency (20%)	625,660	729,082	42,379	64,978	791,342	65,060	564,291	123,354	131,246	532,975	147,967	263,073	67,074
Subtotal Total Direct and Indirect Capital Costs	3,753,961	4,374,492	254,276	389,869	4,748,054	390,359	3,385,744	740,122	787,474	3,197,852	887,803	1,578,439	402,443
Contractor Profit	225,238	262,470	15,257	23,392	284,883	23,422	203,145	4,407	47,248	191,871	53,268	94,706	24,147
Total Contract Costs	**$3,979,198**	**$4,636,962**	**$269,533**	**$413,261**	**$5,032,937**	**$413,780**	**$3,588,889**	**$784,530**	**$834,723**	**$3,389,723**	**$941,071**	**$1,673,145**	**$426,590**

**Costs not include USACE project management, institutional controls and O&M.

11.0 STATUTORY DETERMINATIONS

Under CERCLA §121 and the NCP, the lead agency (EPA) must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

11.1 Protection of Human Health and the Environment

The Selected Remedy for the Site (Residential Alternative 4C and Mine Waste Alternative 5B) will protect human health and the environment by:

- Preventing direct contact, including ingestion, dermal contact and inhalation of soils and soil dust containing lead above health-based levels
- Restricting access to remaining contaminated soils through institutional controls
- Consolidating and covering remaining mine waste piles to reduce wind blown lead contaminated dust and water erosion.
- Assisting in changing residents' living and recreational habits through public health actions and institutional controls

Implementation of the Selected Remedy is not expected to pose unacceptable short-term risks.

11.2 Compliance with ARARs

The Selected Remedy for the Site will comply with Federal and State ARARS that have been identified. No waivers of any ARAR is being sought for the Selected Remedy. Where a State ARAR is equivalent or more stringent than a corresponding Federal ARAR, only the State ARAR is identified. The ARARS for the Site are provided in Table 6-1.

11.3 Cost-Effectiveness

The Selected Remedy is determined to be cost-effective. This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and also ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria (long-term effectiveness and permanence; reduction in toxicity, mobility and volume through treatment; and short-term effectiveness). Overall effectiveness was then viewed relative to cost to determine cost-effectiveness.

The relationship of the overall effectiveness of the alternatives was deemed to be proportional to the costs, thus, the alternatives represent a reasonable value for the money to be spent.

11.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

The Selected Remedy represents the maximum extent to which permanent solutions can be utilized in a practicable manner at the Site. No treatment technologies are proposed for the Selected Remedy. Of those alternatives that are protective of human health and the environment and comply with ARARs, the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria and considering State and community acceptance.

11.5 Preference for Treatment as a Principal Element

The Selected Remedy does not use treatment as a principal element. Lead contaminated soils will be excavated and properly disposed of, and remaining source areas capped.

11.6 Five-Year Review Requirements

Because the Selected Remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within five years after commencement of the remedial action.

12.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for OUs 00-3 released for public comment on July 23, 2002 presented remedial action alternatives for residential soils and mine waste piles. Remedial options for the non-residential areas were not clearly differentiated from the mine waste alternatives, and the only option presented in the proposed plan for the non-residential areas was excavation and disposal in a local repository. After reviewing all written and oral comments submitted during the public comment period, EPA re-evaluated the remedial alternatives best suited to addressing the non-residential areas. Several comments were received expressing concern regarding the potential removal of large tracts of soil and vegetation, while other comments expressed concern that a discussion on the non-residential areas was not apparent in the proposed plan.

Based upon the evaluation, remedial options for the non-residential areas were identified and clarified in the ROD. These options include: (1) excavate and dispose of lead-contaminated soils up to a depth of 18 inches; or (2) leave lead-contaminated soils in place with appropriate land use controls until a deferred cleanup can be undertaken by individual property owners. EPA will work closely with the local community, the State, and individual private property owners to determine the appropriate action for each property.

If remediation is deferred, EPA and the State would work with the City of Eureka and the County of Juab to establish, implement, and enforce institutional controls. In addition, EPA plans to work with individual property owners to minimize the usage of travel corridors across private properties with residual lead contamination. Specifically, EPA will consider the potential for building a travel corridor through such properties which would limit off-road vehicle users' contact with soils and dust. This may include the construction of a bikeway or other path, by excavating and disposing of contaminated soils and capping with an appropriate road cover. A paved corridor would be built only with the property owners' consent.

13.0 RESPONSIVENESS SUMMARY

This Responsiveness Summary addresses public comments on the United States Environmental Protection Agency's (EPA's) Proposed Plan for lead-contaminated soils at the Eureka Mills NPL Site (the "Site") in Eureka, Utah. On July 23, 2002, EPA issued its Proposed Plan. The public comment period was held from July 23 to August 21, 2002. On July 31, 2002, EPA conducted a public meeting in Eureka to present the Proposed Plan and to accept oral and written public comments.

EPA distributed a Proposed Plan for remedial action at the Eureka Mills NPL Site in Eureka, Utah. The Proposed Plan identified the preferred alternative for the Site. The major components of the proposed alternative were as follows:

Residential Properties:

- Cleanup of lead contaminated soils in yards;
- Disposal of contaminated soils in a repository;
- Public health actions until the remedial action is completed;
- Institutional controls to ensure the long-term protectiveness of the remedy.

Mine Waste Areas:

- Regrade all mine waste piles and cover with either a rock or vegetative cover to prevent dust blowing or surface water runoff;
- Addressing non-residential areas primarily in the south-east quadrant of the Site as further discussed in the ROD;
- Implement institutional controls at all mine waste areas and non-residential areas;

EPA received oral comments on the Proposed Plan during the July 31, 2002 public meeting in Eureka, and eight letters during the public comment period from July 23 to August 21, 2002.

SUMMARIZED PUBLIC COMMENTS

Verbal Comments Received during the Public Meeting

1. **Comment:** *(a) Has EPA given any consideration to the amount of the snowfall in this area, and how much mine waste material will wash off the mine waste piles through all that cobble? My comment is that I would prefer a soil cap with some type of [vegetative] growth to keep the mine waste piles from eroding. (b) Plus, the slopes on those mine waste piles are steep. Reasonably, a one to one slope would make me feel more comfortable.*

Response: 1(a). Yes, as a common engineering practice, local precipitation is considered in the design of the cap for the mine waste piles. Both vegetative and rock covers will be considered in the design based on site-specific factors. These factors include but are not limited to slope stability, volume of material to be handled and the preservation of historic features. Although a soil cap with vegetation may be an acceptable repository cover, this type of cover can be difficult to establish and maintain in an arid climate like Eureka. For this reason, rock covers are easier to construct and maintain. To prevent the erosion of soil particles through a rock cover a filter fabric will be placed under the rock.

1(b). Rock covers are preferred for stabilizing a steeper slope which may be necessary on some mine waste piles in Eureka to avoid increasing the areal extent of the mine waste pile and to preserve some of the historical head frames.

2. **Comment:** *(a) My mother, grandmother, and my own family have been raised in Eureka and we are fine. I don't have the fear that [lead is causing health problems]. (b) I think the smartest thing you could do is start down at the south end of town and work your way up, because then that way there's no re-contamination of cleaned up areas. (c) My choice is to keep our area a mining area, with the historical value. And try do it all together instead of hopping here, there, everywhere.*

Response: 2(a). EPA believes the lead-contaminated soils pose a serious health risk because close to 40 children tested in Eureka have blood lead levels above a level recommended by the medical profession. Childhood blood-lead (PbB) concentrations at or above 10 micrograms of lead (Pb) per deciliter of blood (μgPb/dL)) are considered by EPA to present risks to children's health.

Lead exposure to children is known to cause central nervous system effects resulting in learning disabilities, hearing impairment, and behavioral difficulties. Typically, these adverse effects are associated with exposures that occur over an extended period of time. Subtle signs of lead-induced effects begin to become apparent at blood lead levels of 10 μg/dL or even lower, with effects becoming more clear by 30 to 40 μg/dL.

2(b). During the Removal Action, the approach for cleaning up residential properties focused on addressing the worst properties first. These were properties with soil lead levels greater than 3000 parts per million (ppm) or where there were children with elevated blood lead levels. This resulted in an approach to cleanup which would not be as efficient when cleaning up large numbers of properties as will be done under the remedial action. During the remedial design, EPA will develop an approach for cleaning up residential properties in an efficient and systematic manner. EPA and the State will work with the community in developing this approach taking into consideration the potential for re-contamination from blowing dust and other factors.

2(c). EPA and the State recognize that there is a range of views held by the public on the preservation of Eureka's mining legacy, including historical features such as head frames. Some community members have expressed a strong desire to preserve mining features and artifacts while others have deemed such preservation activities to be of secondary importance. Since the selected remedy minimizes the excavation of mine waste piles in most cases, the remedy should allow the retention

of historic features such as head frames. There may be situations where we may be unable to preserve a historical feature due to the lack of structural integrity. EPA and the State will work with the community and the State Historic Preservation Office during the design to preserve historical features such as head frames to the maximum extent possible.

3. **Comment:** *I'm here speaking on behalf of Chief Consolidated Mining Company. We have several comments: (a) There is an error in Table 2.2 in the feasibility study on remedial goal numbers. (b) Based on this (air) data, capping is not necessary. It's not cost-effective. Institutional controls such as fencing and education can reduce the risk. We can change recreation patterns. (c) EPA needs to be more attentive to the use of drought tolerant species when they are doing remediation. We're seeding in dry areas (periods) in the summer, which is relying on a lot of the water use. (d) It also appears the EPA is spending more money than as necessary on remediating some of these areas. Fences and cement walls are going in where there may not have been. Other places have gravel on slopes. it's going to wash away, it's not going to stay in place, it's not compactible.* (e) *In summary, it seems like a lot of money is being spent that may not have to be spent on capping these waste piles. Right now, the air data and risk assessment is showing that the airborne is not the risk. It's the direct contact. The kids are out playing in it, so we need to try to focus on that. Maybe getting them to recreate somewhere else. It would be more cost-effective.*

Response: 3(a) The preliminary remediation goals presented in Table 2.2 of the Feasibility Study Report (July 23, 2002) are correct. An earlier version of the Feasibility Study report did have some mistakes in the table.

3(b) The primary focus of EPA's and the State's investigation and cleanup at the Site has been lead-contaminated soils. According to the Site Conceptual Model and risk information evaluated for the Baseline Human Health Risk Assessment (BHHRA), it is ingestion of soil, not inhalation, that is the primary risk driver for lead exposure in Eureka. Inhalation exposure was determined to be a very small source of risk (less than 0.2%) compared to incidental ingestion of soil. Consequently, EPA and the State have concentrated its efforts on addressing the threat to human health posed by incidental ingestion of soil.

At the time of the BHHRA, EPA did not have site specific air monitoring data and assumed default values for the risk assessment. In the fall of 2001, EPA conducted a limited outdoor air monitoring program at the Site. This program only collected air data for particles less than 10 microns (μm) in diameter from three locations at the Site. During the summer of 2002, EPA expanded the outdoor air monitoring program during the Removal Action to more fully characterize the dust blowing from the mine waste piles and around town. EPA and the State suspect that there is much more dust in particles ranging from 30-120 μm which are readily picked up on fingers and toys. Dust particles in this size range can also be inhaled and trapped in the nasal passages and then ingested through the back of the throat.

The risk assessment indicates that soil and household dust is a significant contributor to elevated blood lead levels. However, recent data from personal air samplers suggest that airborne particulates may be a greater source of exposure than we originally thought. This data combined with our

knowledge of the children's recreational activities leads us to believe that this exposure pathway may be contributing to elevated blood lead levels and should be addressed.

Without capping the mine waste piles, wind blown dust and surface runoff from erosion will continue to be a source of exposure due to direct contact as well as through the inhalation route. Institutional controls and educational outreach activities can be used to supplement the effectiveness of engineering controls, but alone, they would not be effective in reducing exposure to lead contamination in Eureka. Regrading the mine waste piles to establish stable slopes and capping the mine waste material is the most cost-effective means of reducing exposure from wind blown dust and surface runoff.

3(c). EPA has consulted with several State and local agencies to identify the most drought -tolerant species for re-vegetating reclaimed areas. These agencies include the Utah Department of Agriculture, Juab County Extension office and the Utah Highway Department. EPA recognizes that re-seeding is occurring during dry summer periods, but due to scheduling and other constraints, re-seeding needs to occur at the time a yard is remediated. If re-seeding were left to the fall, there would not be sufficient time to complete all properties and ensure that vegetation was established. Also, the clean backfill would be exposed to wind and water erosion if the disturbed areas were not re-vegetated immediately. EPA and the State will continue to look for the most efficient drought tolerant practices in re-vegetating reclaimed areas.

Restoration efforts using gravel as a final surface material is acceptable from an erosional standpoint and has been used in some instances based on a resident's request. In some cases, the use of gravel avoids the difficulty of re-establishing vegetation.

3(d). During the Removal Action, EPA replaced features such as fences and retaining walls where either one existed prior to soil removal or where a dramatic difference in elevation between two properties would result in erosion problems without a retaining wall. EPA's primary objective is to reduce exposure to lead contaminated soils as cost effectively as possible. Meeting this objective may result in improvements to some properties but it is secondary to reducing exposure to lead contaminated soils. If a property owner request it, gravel is an acceptable substitute to re-vegetating an area after it has been backfilled with clean topsoil. EPA will ensure that the gravel is placed on slopes where it will not be washed away.

3(e). EPA believes that capping the mine waste piles is the most effective alternative available to reduce the potential for contact with the contaminated material. The mine waste piles are a principal source of lead-contaminated dust. Some of this lead-contaminated dust has been deposited inside homes in Eureka. Sampling conducted for the risk assessment showed elevated levels of dust in some homes.

EPA and the State agree that children should not be playing in the contaminated soils, but since the entire town with the exception of a few residential yards is contaminated, it is difficult to re-direct their play activities to non-contaminated areas. Capping mine waste piles, remediating residential yards and implementing Public Health Actions will be a much more effective approach.

4. **Comment:** *(a) Is this simply a proposal for money to continue, or is the funding already available and the cleanup will take place? (b) We heard that there is no Superfund. And if there isn't then what monies are going to pay for this?*

Response: 4(a). The Proposed Plan is not a proposal for funding but EPA and the State's proposal for the long-term cleanup of the Site. The Superfund process requires EPA and the State to present a Proposed Plan to the public for their comment. Public comment is followed by a Responsiveness Summary and Record of Decision (ROD), which explains what remedy EPA and the State selected and why. EPA is not able to use Superfund monies until we have selected a remedy and the Site is listed on the National Priority List (NPL or Superfund List). Since the close of the public comment period, the Eureka Mills Site has been placed on the National Priority List making it eligible to receive federal clean up funds.

4(b). The Superfund program does exist but the tax on the chemical industry has expired and has not been renewed by Congress. At the present time, Congress approves an annual budget for Superfund cleanups that is based on general tax revenues and money still in the Superfund account. Because this Site ranks high in light of the actual exposures of a number of children to lead contamination, there is a strong likelihood that EPA will receive funding for the cleanup.

5. **Comment:** *You have 231 parts per million, why is it that some of these other places that are higher do not get cleaned up before the places that are lower, where people are living?*

Response: The Removal Action cleanup over the past two summers used a cleanup strategy where properties with soil lead concentrations greater than 3,000 ppm or where children had blood lead levels greater than 10 μg/dL were cleaned up. The proposed long-term remedial action will have a broader focus and will implement residential cleanups for all properties with lead contaminated soils greater than 231 ppm.

6. **Comment:** *A lot of folks around town have been asking why we're so aggressively cleaning up one block in particular. There's been no children there for several years. Can we address that? Isn't the purpose of this cleanup to protect the children?*

Response: As part of the cleanup strategy discussed in the preceding responses, EPA evaluated whether children spent time either playing in or visiting these properties with high levels of lead contaminated soil (regardless of whether they actually lived at the property). EPA and the State are very concerned about children being exposed but that is not the only reason for the cleanup. For instance, women who are pregnant and other adults could also be exposed to high levels of lead and would also be at risk.

7. **Comment:** *I live about 100 feet below the Chief No. 1. You're taking all of the contaminated material from town and placing it a hundred feet from my house, putting my children at higher risk than they were prior. On the bottom of my house in an old railroad grade. I haven't heard any results on the lead dust testing at my house. I was told that the lead levels in my front yard are over 10,000 parts per million.*

Response: EPA has proposed using the Chief Mine No. 1 waste pile as a repository for soil disposal. This repository site is currently a source of lead contaminated materials with few engineered controls in place to minimize fugitive dust, surface runoff and direct contact. Hence, the Chief Mine No. 1 waste pile is already a dust problem. The remedial actions planned for the Chief Mine No. 1 include placement of cover material on the waste pile, surface run-on/runoff controls, dust mitigation measures, and other engineering controls to stabilize the repository site. During the cleanup, EPA will be closely monitoring dust levels at active construction areas such as the Chief Mine No. 1 waste pile to ensure that dust control measures are protective of both the near-by residents and the workers. Public health actions including education will increase the public's awareness of measures they can take to prevent their children from being exposed.

EPA will provide any soil or dust sample results to the individual property owner.

8. **Comment:** *We have a downwind problem. Downwind, it's 10,000 ppm and the mine dump is 37,000 ppm. You clean it last and the wind blows uptown. Where are all the particles going, on everything you've already cleaned?*

Response: Most of the mine waste piles are located **upwind** of town at the western end. The mine waste piles at the western edge of town will be addressed early on in the remediation process to avoid re-contamination of residential properties. These piles are one of EPA and the State's highest priorities when we begin cleanup. Proper use of dust control measures is critical to minimizing dust. With the installation of the new water main, water will be more readily available for dust control than was the case during the Removal Action. In the interim until a mine waste pile can be remediated, dust suppressants may be applied to control dust from the mine waste piles.

During the summer of 2002, EPA sampled several residential yards that had been cleaned up during the previous summer to determine if the yards had been re-contaminated. The sampling results did

not show any re-contamination in the cleaned up yards.

9. **Comment:** *What is the impact of nitrates from cow manure on the watershed? If it gets into the well, who is responsible? Is the State going to close down our well? Is the State going to come back and help us? We want it in the paper, stating that it is not a hazard to health.*

Response: EPA and UDEQ have consulted with the State engineer and determined that the use of manure as a soil amendment will not pose a health hazard. The amount of material stockpiled for use is small, and the minimal amount of precipitation experienced over the past construction season has not been sufficient for any leaching or migration of nitrates into the watertable to have occurred. EPA and the State will include a discussion on this issue in our next Fact Sheet.

10. **Comment:** *I live on the road that all the dump trucks go past. Can I have the air test, the dust tested?*

Response: During Remedial Action, EPA will conduct extensive monitoring, especially along the roads with haul truck traffic. In addition, a dust control program will be developed and implemented during construction activities. These activities will include watering, modifying remedial activities during windy periods, use of covered dump trucks and keeping streets clean. Periodically during the cleanup, EPA will also make the air monitoring results available to the public.

Written Comments Received During the Public Review Period

11. **Comment:** *(a) How did the EPA decide that residential levels of 231 ppm at the surface were worthy of cleanup and 230 ppm were not? Have scientific studies been performed to show that this is the acceptable limit? (b) What were the accuracy specs on the XRF machine? (c) I would like the EPA to at least consider averaging the top surface and 0-6" readings. We wish to be included in the cleanup.*

Response: 11(a). The cleanup level of 231 ppm is an estimate based on very protective assumptions and the most sensitive population - children who would always have maximum contact with contaminated soil. The number is not an exact number but it is highly unlikely that it will underestimate exposure. A decision must be made at some point and EPA felt that this value would be very protective.

11(b). The calibration check acceptance limits for the XRF analysis of lead in soil were 75-125%. A total of 783 calibration checks were run on the XRF, and all were within the acceptance limits, resulting in 100% accuracy for calibration. In addition, 10% of all composite surface soil samples analyzed by XRF were also submitted to a laboratory for independent analysis. The data indicate that 95% of the soil samples demonstrated acceptable comparability limits between the field (XRF) and the laboratory results.

11(c). EPA may consider additional sampling of properties where surface lead levels may be very close to the cleanup level.

12. **Comment:** *I live about 100 feet away from the chief mine dump. The EPA is taking contaminated soil from other yards and dumping it behind my house. I firmly believe that my children will have long term effects from this.*

Response: EPA has proposed using the Chief Mine No. 1 waste pile as a repository for soil disposal. This repository site is currently a source of lead contaminated materials with few engineered controls in place to minimize fugitive dust, surface runoff and direct contact. Hence, the Chief Mine No. 1 waste pile is already a dust problem. The remedial actions planned for the Chief Mine No. 1 include placement of cover material on the waste pile, surface run-on/runoff controls, dust mitigation measures, and other engineering controls to stabilize the repository site. During the cleanup, EPA will closely monitor dust levels at active construction areas such as the Chief Mine No. 1 waste pile to ensure that dust control measures are protective of both the near-by residents and the workers. Air monitoring at properties adjacent to the Chief Mine No. 1 waste pile during the removal activities in 2002 did not show dust levels above any health based standards. EPA will continue to work closely

with residents whose homes border the Chief Mine No. 1 waste pile to minimize the dust levels at their homes during the cleanup.

13. **Comment:** *The rock cover of the mine dump seems to be a good method of containment, however, control of run off water at the base of the dumps is a concern. Control of the open cell for future disposal is also a concern - funding and the site location of private property will be an issue for Eureka City. Funding for long-term maintenance is also an issue for Eureka City. The flat area in the Southeast part of the city is a concern, as I would not want to see the surface stripped away.*

Response: Appropriate surface runon/runoff controls will be part of the final design for the mine waste piles. The design efforts will specifically address the control measures required for proper direction of runoff, rates of runoff and impacts to property owners adjacent to and downstream of diverted runoff. The design would include an evaluation of a rock cover, as this type of cover would reduce the overall surface runoff from a capped pile.

EPA recognizes the issue of funding limitations by the City of Eureka, and EPA plans to work closely with City officials and the State of Utah in developing, implementing and enforcing institutional controls.

For the last concern raised in this comment, please see the response to Comment # 15 for a complete response to this concern.

14. **Comment:** *Please consider what the removal of vegetation (at non-residential areas) would do as far as wind, drifting snow, etc. Possibly remove 20-30 feet, provide clean dirt, plantings in each phase.*

Response: EPA is very concerned about the removal of vegetation in the non-residential areas and the dust control problems that would result if all of these properties were cleaned up at once. Currently, the area is heavily vegetated with sage brush and grasses which limits the amount of open area. This confines motorized recreational vehicles to a few well-traveled corridors across this area. With the heavy vegetation, snow is trapped allowing more moisture to seep into the soil and be available for plant growth. Aside from the natural forces of wind and the lack of adequate precipitation, there is the issue of motorized recreational vehicles traversing through these properties after they have been remediated. If the area is not successfully re-vegetated, dust control will be a major problem for the community.

For the non-residential areas in the southeast quadrant of the Site, EPA plans to implement one of the following two response activities to address lead contamination: (1) excavate and dispose of lead-contaminated soils up to a depth of 18"; or (2) leave lead-contaminated soils in place with appropriate land use controls until a cleanup can be undertaken by individual property owners at the time of development. EPA will work closely with the individual property owners in assessing whether to clean up these properties during Remedial Action or to defer cleanup until development. For large properties that are remediated, additional measures such as fencing and adequate watering by the property owner to promote and maintain a vegetative cover would be necessary. Because remediating

such large areas all at once would present a major dust control problem of concern to local officials and the community at large, EPA will consider ways to address that concern as well.

EPA and the State will also work with property owners of these non-residential areas to minimize the number of travel corridors across private properties with lead contamination. To limit the exposure of users of motorized recreational vehicles in traversing these contaminated areas, construction of a travel corridor (pavement or gravel surface) could be considered as an interim measure until the areas were cleaned up. Agreement with the property owners would be necessary for this type of measure to be implemented.

15. **Comment:** *Dump site chief #1 north slope has no head frame and should be sloped to allow natural vegetation to establish. Reclaiming this slope to natural vegetation is the best long-term solution to movement of soil. Even natural vegetation would need some help to quickly establish and survive.*

Response: EPA is aware that there is no head frame remaining at the Chief Mine No. 1. During the design EPA and the State will evaluate both types of cover material (rock or vegetation) to use in capping the mine waste piles. The evaluation of cover types would be based on a number of criteria in addition to retaining historic features such as head frames. These include: 1) minimizing the areal extent of the mine waste pile; 2) stabilizing slopes to prevent erosion; and 3) reducing direct contact with contaminated material by covering the pile; and 4) directing surface run-on and run-off around the pile. Although a vegetated slope may be more desirable to look at, it will require more gentle slopes which would increase the areal extent of the mine waste pile. A vegetated slope is also more difficult to establish and requires more maintenance over the long term. Hence, EPA and the State believes that a rock cover will be more effective over the long term.

16. **Comment:** *I am in 100% support of the Superfund cleanup moving forward for two reasons. First, I am not willing to put my children's health at risk. Second, Eureka has this black cloud over our heads of being a contaminated community. This will not change until the cleanup is complete.*

Response: EPA appreciates your support for the proposed cleanup of lead-contaminated soils in Eureka. EPA hopes to move forward as quickly as possible to complete the cleanup and to assist the community in removing the stigma of being a Superfund site.

Written Comments from North Lily

JBR Environmental Consultants, on behalf of North Lily Mining Co., submitted extensive written comments dated June 28, 2002 on the Proposed Plan. While these comments were received outside the formal public comment period, EPA has included a summary of these comments in the Responsiveness Summary to respond fully to all parties concerned. The comments were divided between mine waste and residential area alternatives. In general, the mine waste comments were supportive of the preferred Alternative 5B - Partial Excavation/Capping with Combination Disposal at Chief Mine No.1 and Secondary Site and provided suggestions on design considerations. The residential area comments advocated Alternative 4B - Excavation/Disposal at Secondary Site near

Eureka, rather than the preferred Alternative 4C - Excavation/Combination Disposal at Chief Mine No. 1 and Secondary Site. The residential comments also provided suggestions for further evaluation of interior dust and the development of a comprehensive dust management program.

Mine Waste Remediation:

Most of the comments submitted on mine waste remediation pertain to design issues that will be determined during the remedial design phase of the project; therefore; comment responses are very general in nature.

17. **Comment:** *To the maximum extent possible, stabilize waste rock in place. Consider the impact on adjacent develop-able land when considering mine waste rock dump stabilization. Regrading to stabilize dump slopes that result in a flatter slope than absolutely necessary could result in the loss of adjacent develop-able property. If possible, use angular rock for the cover. Don't rule out "quarrying" the rock cover material out of hand. Cover thickness should be at least twice the d50 of the rock compromising the cover and no less than one foot in thickness. Use quartizite, limestone, dolostone, latite or a combination of these for the cover material. Relatively thick-bedded rocks should be preferred. Avoid the use of thin-bedded limestones, shales or hydrothermically altered igneous rocks. For dumps like Gemini, a system of cribbing tied into gabiens could be used to stabilize the slope toes of the out-slope areas where re-sloping is not practical or too costly.*

Response: EPA and the State agree with leaving as much of each mine waste pile in place as possible. The goals of the design for each mine waste pile will be to cap in-place while providing for stable slopes and minimizing the impacts to historical features and to adjacent property. Mine waste material will only be removed in situations where the volume of material at a particulate location does not allow the establishment of a stable slope. EPA and the State will consider the potential land uses of adjacent properties when designing the reclamation of the mine waste piles.

The comments related to the type of cover material are very useful and will be considered in more detail during the design phase of the project. Some of the design elements that will be considered in the design of the mine waste piles include slope stability, historic preservation, potential re-use of sites, long term operations and maintenance, cost vs. type of materials, and the availability of materials.

Residential Areas

18. **Comment**: *The preferred alternative should be 4B. From the standpoint of reclamation and stabilization, mixing residential soil and waste rock may not be the best solution. The use of Chief Mine No. 1 dump for residential soil disposal will lead to on-going dust problems.*

Response: Residential Alternative 4B was not selected by EPA and the State because the costs for implementing it were slightly greater due to hauling distance and cost to construct a repository that met State landfill requirements. More importantly, the planning time to implement Alternative 4B would have delayed the start of the cleanup by up to a year was a major factor in EPA and the State's decision to select another remedial